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September 19th, 1959

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Anthrax

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SUMMARY.—A synopsis is given of the incidence and general features of anthrax. The methods of controlling the disease in Great Britain are described.

Introduction

ANTHRAX is not a cause of serious loss among livestock in Great Britain. Its main importance lies in the public health aspect and the fact that if strict control measures were not enforced, infection could become widespread with greatly increased danger to both human beings and animals. It is a disease primarily of animals and as such occupies rather a special position in the public mind; even to the urban dweller, the name itself has a sinister meaning and, among the older ones at least, stirs dim memories of shaving brushes claiming to be free of anthrax. The disease is a dramatic one and it sometimes receives more publicity in the press than it deserves when a peak incidence occurs, as it occasionally does. Fortunately, human beings are relatively resistant to infection but the danger to them has always to be borne in mind and the veterinary profession, in terms of speedy diagnosis and prompt disposal of anthrax carcases, has much responsibility in this respect.

Incidence in Great Britain and Other Countries

Compared with many other countries, the incidence is low in Great Britain. This fortunate state of affairs is in no small way due to the strict control measures which are enforced by law and as infected carcases are quickly diagnosed and disposed of, spread from animal to animal is rare; no doubt the temperate climate is a favourable limiting factor also. During the past 21 years the number of outbreaks annually has ranged from 95 in 1946 to 1,245 in 1956 (Fig. 1), and as it is seldom that more than one animal dies in each outbreak, the overall losses are comparatively small. For instance, the average mortality in outbreaks in 1956 was 1.03 among cattle and 1.19 among pigs, these being the 2 species most commonly affected (Fig. 2). Of the 4,668 outbreaks in 1952/58, 4,104 (88 per cent.) were attributed to infected feeding-stuffs and fertilisers (Fig. 3), and though it may not always be possible to prove contamination by bacteriological means, the evidence strongly suggests that they play a major rôle in the epidemiology of anthrax in this country. This is supported by the fact that the incidence of the disease was at its lowest during the war years (Fig. 1) when imports of feeding-stuffs and fertilisers were at a minimum.

Soil-borne infection is rare in this country but there are a few areas where such infection does exist and cattle and other susceptible animals grazed on these lands must be vaccinated annually if losses are to be avoided. These areas are usually riverside pastures in districts where leather tanning is a common industry and though positive evidence is lacking, the obvious inference is that infection originates from tannery effluents discharged into the rivers and their tributaries. Evidence is against the multiplication of the organisms in the ground and heavy soil

FIG.1.

ANTHRAX OUTBREAKS 1938/58

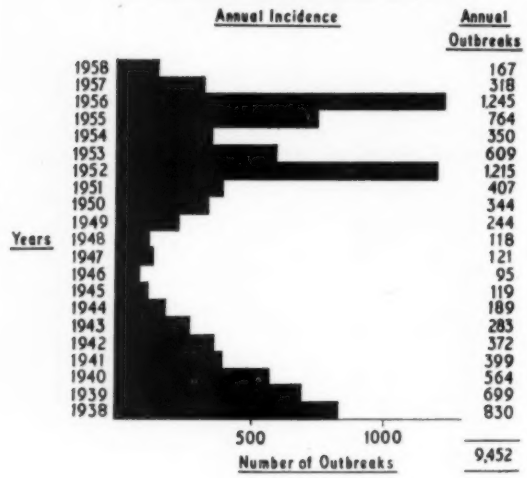


FIG.2

ANTHRAX OUTBREAKS 1952/58

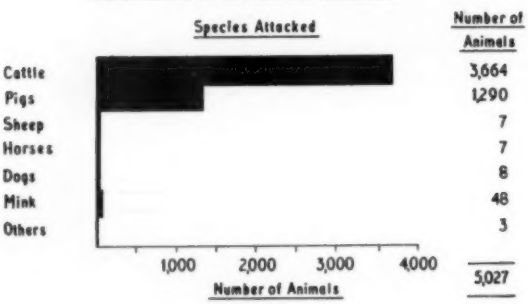
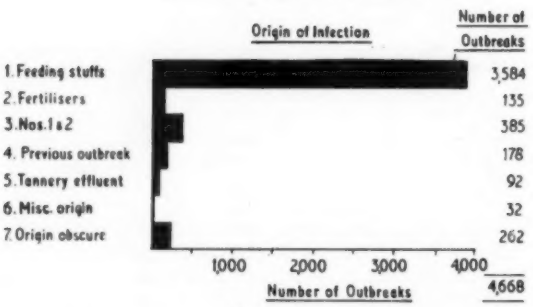


FIG.3

ANTHRAX OUTBREAKS 1952/58



Compiled from Reports on the Animal Health Services in Great Britain, H.M.S.O., London.

contamination is more likely the result of a steady build-up of infection over years. Minett and Dhanda (1941) showed experimentally that *B. anthracis* could multiply actively in wet sterilised soil but not in unsterilised soil, the bacteria in the latter apparently exerting an antagonistic effect. Van Ness and Stein (1956) have suggested that soil-borne infections are more common on certain neutral or alkaline soils with a high nitrogen content and it may well be that such conditions favour the persistence of spores rather than aid their multiplication.

In a few outbreaks, especially in foxhounds and wild animals in captivity, infection can be traced to knackery meat and offal and it would seem therefore that a few cases of anthrax escape detection.

The incidence in other European countries follows much the same pattern as in Great Britain. Some are more seriously affected than others, notably Greece, Spain, and Turkey, but it is in the tropics and subtropics that anthrax may assume dangerous proportions. In these regions, the climate favours sporulation, infection may be spread by animals which devour anthrax carcases, and control measures are difficult and costly to apply over large and thinly populated areas.

Aetiology

Bacteriology. Virulent *B. anthracis* is too well-known to require a detailed description here. Its main, but not exclusive, features are the production, under certain conditions, of a capsule and the formation of spores which are very resistant to destruction. Many other organisms resemble it morphologically, some even to the formation of spores and capsules, but the aerobic saprophytic forms of bacilli such as a *B. megatherium, B. cereus, B. subtilis,* and others are not pathogenic unless they are administered in relatively enormous numbers. The anthrax bacillus is 3 to 8 μ long and 1 to 1.2 μ wide; it is gram-positive and non-motile and the ovoid spores which form centrally do not cause it to bulge. If an infected blood film is stained for 3 to 4 minutes with an aged 1 per cent. aqueous solution of methylene blue, or with Leishman or Giemsa, the bacilli appear blue surrounded by a reddish purple capsule with a rather diffuse edge. Methylene blue must be used with caution as occasional batches may be encountered which react poorly with the capsule. If spores are present, they will appear as clear, oval areas in the centre of the organisms or, if they are free, as clear refractile bodies. Special methods are required to stain the spores themselves.

When virulent *B. anthracis* is grown under normal atmospheric conditions on ordinary laboratory media, the colonies which appear within about 24 hours are in the "rough" phase; they are large, flat, with curling edges, and for this reason *B. anthracis* has for long been thought an exception to the rule which regarded the ability of an organism to form small, sharp-edged, "smooth" colonies as a feature usually associated with virulence. However, it has been shown (Nungester, 1929; Sterne, 1937) that the production of "rough" colonies is due to growth under unsuitable conditions. If the media is enriched with serum and growth occurs in a high concentration of carbon dioxide, the colonies which appear are small, raised, and glossy with clearly defined edges. The bacilli forming them are in short chains and surrounded by capsule much as is seen in an infected

blood film; some may show spore formation.

The exact conditions necessary to stimulate sporulation are not clear but it seems that it does not occur within an infected animal unless the carcase is opened or mutilated. It is believed that an oxygen deficiency or a carbon dioxide excess may depress it but other factors may be involved.

Pathogenicity. Until quite recently, the exact cause of death in anthrax was obscure. No lethal toxin could be conclusively demonstrated in cultures of the organism and the *post-mortem* appearances and the massive terminal bacteraemia common in some species suggested that death was due to anoxia caused by the oxygen demands of the enormous numbers of bacilli in the blood and tissues and by blockage of the capillaries. This, however, could not explain death in some animals, such as the pig, in which the circulating bacilli are often few in number. The theory that a pharyngeal oedema could cause asphyxia could not be supported as this is by no means a constant symptom in this animal.

In recent years, much light has been thrown on this aspect and the cause of death in anthrax is now much clearer. Sterne (1937) deduced from experimental evidence that some factor other than capsule was involved in virulence but it was only recently that this deduction was confirmed. Smith *et al.* (1955) and Harris-Smith *et al.* (1958) have shown that under certain conditions *B. anthracis* does in fact produce a lethal toxin both *in vivo* and *in vitro*; it is present in the plasma of animals dying or dead of anthrax and when produced *in vitro*, it is maximal in the culture after 4 hours' incubation and disappears after 7 to 8 hours. This early disappearance probably explains the failure by many other workers in the past to identify it with certainty. This toxin is an oedema-producing and tissue-damaging agent; it causes death by secondary shock with acute renal failure and its effects are specifically neutralised by anti-anthrax serum. Once a certain stage has been reached in the infection and the toxin has produced its effect, treatment of the animal with antiserum, or with antibiotics at a level sufficient to rid the body of infection, will be of no avail. This stage is reached when the bacilli appear in numbers in the blood. It is this toxin which plays the major rôle in the production of immunity (Smith, 1958a).

The function of the capsule, of which the main component is polyglutamic acid, is to block the defensive mechanisms of the body such as phagocytosis, thus allowing the organisms to multiply and liberate the toxin which eventually destroys the host. The capsule itself does not appear to possess any toxic properties.

To be fully virulent, therefore, a strain of *B. anthracis* must be able to produce the maximum amount of toxin and capsule; a strain which can produce neither will be fully avirulent and non-immunogenic. Between these two extremes lie a series of intermediate variant strains differing in virulence, their capacity to kill depending on their ability to produce these two factors. All such strains are not stable and on subcultivation, or passage through susceptible animals, their characteristics may alter considerably and their virulence be enhanced or decreased.

These variant types may be found in all virulent strains of *B. anthracis* and it is now recognised that the reduction in virulence which occurs when such strains are grown at temperatures above 37° C. is due to the fact that the higher temperatures favour the production of variants at the expense of the virulent parent form, and the degree of attenuation achieved will depend largely on the proportions in which the variants occur in the total bacterial population. As the proportions may vary widely from one culture to another, it is impossible to predict how they will occur, even if grown under identical conditions, and it is difficult therefore to maintain such strains at a standard degree of attenuation.

The Disease

Susceptibility. Few species of animals are entirely resistant to infection but the degree of susceptibility varies greatly. Among domestic farm animals, sheep and goats are highly susceptible, cattle, horses, and pigs less so, but the incidence among them will differ from one country to another, depending on their population densities and the methods of husbandry. In Great Britain, cattle are by far the most frequently involved, followed by pigs (Fig. 2), but in other countries the disease may be more serious in sheep and goats. Among laboratory animals, guinea-pigs and mice are very susceptible, rabbits to a lesser degree. Sheep, goats, guinea-pigs, mice, and rabbits are readily killed by the parenteral inoculation of a small number of virulent spores but cattle and pigs are resistant when infected by this route and are more susceptible when dosed with spores *per os* (Schlingman *et al.*, 1956). From time to time, cases of anthrax may be encountered in other species such as dogs, mink, and a variety of animals found in zoological collections such as elephants, carnivores, and on rare occasions birds. Elephants appear to be very susceptible and in countries where they are worked, anthrax may sometimes cause serious mortality among them. It is interesting to note here that at one time the disease was a problem in the ostrich farming industry in South Africa (Sterne, 1959).

Symptoms. All susceptible animals may die so suddenly that no clinical symptoms are observed. This applies especially to cattle, sheep, and goats, but it is not a constant feature of the disease in these animals and should one be visibly ill from an unknown cause for some days before death, the precaution of taking a blood film to eliminate anthrax should not be overlooked before embarking on a full-scale *post-mortem* examination. Animals visibly affected usually have a high, fluctuating temperature, often reaching 107° to 108° F., and are dull and listless, showing little interest in food. The respiratory rate may be increased and dairy cattle may show a drop in milk yield. Some blood-stained faeces may be passed in the later stages of the disease. Horses may show colicky symptoms and oedematous swellings may occur over the body surface. Pigs may show a subcutaneous oedema, especially in the throat region, but this is not a

constant symptom and, in the intestinal form, death may be preceded by fever, diarrhoea, or constipation only. Dogs may also show oedema in the region of the head and neck (Davies, 1957).

Post-mortem *Changes*. A blood-stained discharge may exude from the body openings and is often frothy when it comes from the nose, but such a discharge is not always present and even if it is, it does not necessarily indicate an anthrax infection. The blood is dark and clots poorly; the spleen is usually swollen and the pulp dark and of a tarry consistency. Pigs, and sometimes dogs, affected with the pharyngeal form may have areas of gelatinous infiltration in the subcutaneous tissues of the head and neck region, but in the intestinal form, lesions may be confined to portions of the intestine, mesentery, and associated lymph nodes.

Changes will vary from one animal to another, depending on the species and the focus of infection, but oedema in any site should be regarded with suspicion.

Diagnosis

There is no syndrome typical of anthrax, and *ante-mortem* diagnosis is difficult when the presence of the disease has not already been confirmed in a herd or flock. If its presence has been confirmed, any animals showing a rise in temperature, with or without clinical illness, should be regarded as infected and treated accordingly. It is possible to demonstrate the anthrax bacilli in blood samples taken from animals in the terminal stages of the disease but this procedure is of doubtful value and may be merely dangerous to both the operator and the other stock.

Post-mortem diagnosis depends on the demonstration of capsulated anthrax bacilli in films prepared with a drop of blood taken preferably from a small peripheral vein such as an ear vein. The films are fixed with methyl alcohol or by gentle heat and stained with 1 *per cent.* aqueous methylene blue. The bacilli stain blue and have sharply truncated ends, the capsules appear as reddish-purple envelopes, and capsular debris may give a patchy reddish-purple background. In cattle, sheep, and goats, the organisms are usually single or in pairs; the presence of long chains should make one suspect that it is a saprophytic organism except in the case of pigs, and occasionally horses, where *B. anthracis* may be more filamentous (Sterne, 1959). It must again be emphasised that some batches of methylene blue fail to give good staining differentiation and only batches known to be reliable should be used. Other stains which are useful, and possibly more reliable, are Leishman and Giemsa but they are not commonly employed. The reader is recommended to refer to the B.V.A. Handbook "Laboratory Aids to Clinical Diagnosis" (1952) in which blood films are excellently illustrated by colour photographs.

Overfixation by heat should be avoided though it must be remembered that lightly fixed blood films may remain infective; they should be handled with care and disposed of properly. Some non-capsulated bacilli may shrink and distort and give a false impression of a capsule; other bacilli which may appear in a blood film as *post-mortem* invaders can produce a capsule and it is not always easy to distinguish them from *B. anthracis*. Blood films taken from cattle, sheep, or goats, recently dead of anthrax usually contain countless bacilli and are readily identified; putrefactive changes, however, gradually destroy the organisms, and films made from putrefying carcases may show no bacilli or only "shadows" of them and the presence of putrefactive organisms further confuses the picture. Remnants of the capsule may persist but diagnosis at this stage is made immensely more difficult. Cultural examination in the laboratory may detect the few remaining organisms but even this procedure may be useless. A further complication which has arisen in recent years is caused by the widespread use of antibiotics in febrile conditions of unknown origin; if used late in an anthrax infection, they may remove all traces of the bacillary infection but fail to save the animal's life. In such cases, it may be impossible to establish the cause of death with certainty. Some animals, notably the pig, may have few, if any, bacilli circulating in the blood; infection is confined to a local lesion either in the pharyngeal region, in the abdomen, or elsewhere, and only films or swabs made from these lesions or the associated lymph nodes are likely to be of any use. Unfortunately, this involves opening the carcase, and in such cases the greatest care has to be exercised to keep the incisions to a minimum and to avoid spilling body fluids.

This is not intended to depress the clinician who has to make a quick diagnosis under field conditions but rather to underline the fact that on occasions certain complicating factors may arise which make it difficult, even for the most experienced, to arrive at a diagnosis by blood film examination. In such cases, reliance must be placed on laboratory examination of swabs and films though even then, with full laboratory facilities, a definite diagnosis may be impossible.

Treatment and Prevention

Treatment. Because symptoms are often absent before death, especially in herbivores, treatment is rarely possible. Before the advent of cheap antibiotics, large doses of antiserum given intravenously and subcutaneously were sometimes effective but this depended very much on the stage of the disease when treatment was commenced and on the potency and character of the antiserum used. The more popular antibiotics such as penicillin and chlortetracycline* have a specific effect on *B. anthracis* and are now used with considerable success, often in combination with antiserum, for clinically affected and in-contact animals. Reports differ on the dosage of antibiotic required but it should err on the generous side and a rapidly absorbed form should be used for the initial dose so as to raise the blood level quickly. Penicillin has proved very effective and a dosage rate of 5,000 units per lb. bodyweight should be adequate. Treatment should be continued for some days after the temperature has reached normal. Doses of antibiotics at a much lower rate than this

* Aureomycin.

have been reported as successful in curing the disease but it must be remembered that some species of animals are relatively resistant and may recover without any form of treatment. Once the bacilli have appeared in numbers in the blood, all methods of treatment are generally useless. *B. anthracis* is a penicillinase producer and Barnes (1947), using penicillin to control the disease experimentally in rabbits, has remarked on the large doses which must be given early in infection if they are to be effective. He noted also that treatment should not be discontinued too soon as spores could remain dormant within the body and cause a relapse when the antibiotic level fell below a critical point.

Prevention. Because of the sporadic nature of the disease in this country, prevention by wholesale vaccination is impracticable and unwarranted, but on farms where soil-borne infection is suspected or known to exist, vaccination is indicated. Vaccine has been used with apparent success on farms which hold large supplies of a feeding-stuff which, after purchase, has become suspect of harbouring anthrax spores. The feeding-stuff is withheld until a few weeks after vaccination when it is again included in the rations, so avoiding a considerable financial loss to the farmer. There is some danger, however, in this practice in so far that immune animals may pass the spores in their faeces and so spread infection on the premises.

There are numerous types of anthrax vaccines in use in different parts of the world but the following are the most important:—

1. *Attenuated Vaccine.* Attenuated vaccines are prepared from strains of *B. anthracis* which have had their virulence artificially reduced, that is, they can kill the most susceptible laboratory animals such as guinea-pigs and mice but only a proportion or none of the more resistant ones such as rabbits. In 1881, Pasteur showed the value of these attenuated strains for immunisation in his classic experiment at Pouilly-le-Fort, and since then, vaccines of the Pasteurian type have been used in many countries with good results. However, vaccines of this type have distinct disadvantages; it is not a simple matter to maintain the strains of anthrax at exactly the right degree of attenuation and vaccines made from them may at times be dangerous. Excessive attenuation on the other hand may lead to a lack of immunising power and a fine balance has to be achieved between the two extremes. Furthermore, because of the varying susceptibility of different species of animal, vaccines of graded degrees of attenuation may have to be prepared, the weaker ones being used for the more susceptible animals such as sheep and goats. These types of vaccines are now being gradually replaced by the avirulent form.

2. *Avirulent Vaccine.* This type of vaccine was introduced into South Africa by Sterne (1939) and has since been adopted with considerable success by many other countries including Great Britain. These vaccines are prepared from strains of *B. anthracis* which are incapable of producing capsule under any circumstances and are therefore unable to kill even the most susceptible animals unless inoculated in very large doses. They can, however, produce as much toxin as a virulent strain (Harris-Smith *et al.*, 1958) and are therefore able to induce a strong immunity when inoculated into animals as living spores. Various adjuvants may be added to enhance this effect. These strains are stable in that they show no tendency to revert to the virulent form which is an important point in regard to vaccine production. Avirulent vaccines require only a single dose to immunise strongly, and because of their harmlessness, they may be used in the one form on all species of farm animals. Experimentally, it has been shown that sheep are fully immune in less than a week after vaccination and that the immunity lasts for at least 14 months. To give a margin of safety in the field, however, the "negative" phase is reckoned at 10 to 14 days and the duration of immunity at a year. Sterne (1946) states that horses may take as long as 4 to 6 weeks to become fully immune. The reaction to vaccination varies from one species to another; goats and horses react more severely than cattle and pigs but all show a febrile response for some days. Dairy cattle may show a drop in milk yield but it usually returns to normal after a few days. Vaccination of pregnant sows should be avoided as abortion may occur.

3. *Sterile Anthrax Antigen.* In recent years, workers in this country and the U.S.A. (Gladstone, 1946; Belton & Strange, 1954; Wright *et al.*, 1954) have isolated a fraction from *in vitro* cultures of *B. anthracis* which has powerful immunising properties. This fraction is sterile and non-toxic and when inoculated into animals in 2 or more doses, leaving an interval between them, it immunises them strongly for a considerable period. It has also been used successfully in man (Darlow, 1956). This immunising fraction appears to be the toxin itself in a "toxoided" state (Smith, 1958b), that is, it undergoes a change in culture which renders it non-toxic but leaves its antigenic properties unimpaired. This toxin is the main factor in all immunising procedures; living spore vaccine will liberate the toxin in the animal body but lack of capsule or poor toxin production will limit the natural progression of infection. Thus vaccine strains which are poor toxin producers will induce only a weak immunity.

This method of immunisation with sterile antigen is obviously the logical approach to the problem but at the moment, from the veterinary point of view, the main drawbacks are the need for two or more inoculations if the immunity is to endure and the somewhat higher cost of production compared to the orthodox spore vaccines. However, new methods of production and different methods of application may soon overcome these disadvantages in which case it would then be superior to all other known methods of vaccination.

Control Measures in Great Britain

Anthrax received official notice first in 1886. Since then there have been changes from time to time in the measures adopted to deal with the disease and the latest procedure is embodied in the Anthrax Order of 1938. This Order was made when the investigation of reports of suspected disease became the responsibility of the newly formed Animal Health

Division of the Ministry of Agriculture and Fisheries.

Duty of owners to report suspected case of anthrax. This Order requires "every person having in his possession or under his charge" an animal or carcase affected with anthrax or suspected of being so affected to report the fact to a police constable.

"Animals" are defined as "cattle, sheep, goats, and other ruminating animals, and swine, horses, asses, mules, and dogs, and any four-footed mammal kept in captivity" (excluding mammals in a pathological institute). The last-mentioned group comprises mainly animals in zoological collections and menageries together with mink, foxes, and other animals farmed for their pelts. The domestic cat is not classed as an animal.

Duty of veterinary surgeon to report suspected anthrax. A veterinary surgeon who examines an animal or a carcase and diagnoses, or suspects, anthrax is required to report the fact to a police constable, and is entitled to a fee of 2s. 6d. for each notification. It is not a sufficient discharge of this obligation to advise the owner of the animal or carcase to report the matter. There is no provision in the Order for such delegation of responsibility.

Precautions to be taken by owner. Having reported suspected disease, the owner must take certain precautions at once. He must detain the suspected animal, or carcase, and any other animals which have been in the same building, yard, or field with it; he must prevent further access of animals or poultry to the suspected animal or carcase and disinfect any place which has been contaminated. It is an offence to expose an animal affected with anthrax in a market or lair or to permit it to be on common or unenclosed land, or to graze on the side of a road. It is unlawful also to move an affected animal or carcase by road, rail, or waterway, or in a coasting vessel.

The skin of a suspected carcase must not be cut or anything else done which would cause escape of blood. This prohibition does not apply to a veterinary surgeon, acting on behalf of the owner, who wishes to obtain material for the purpose of diagnosis but the cutting must be limited to the extent necessary to obtain such material. Removal of any part of a carcase, or of any organ, should never be undertaken.

Action by Police and Local Authority. The police constable who receives notice of suspected anthrax passes the information promptly to the appropriate Divisional Veterinary Officer and to an Inspector of the Local Authority, who, in turn, informs the Medical Officer of Health. In a number of counties, the police—or certain members or ranks of the force—are also appointed Inspectors of the Local Authority for the purposes of the Diseases of Animals Acts and Orders and act in a dual capacity. The Inspector of the Local Authority proceeds to serve on the occupier of the premises where the suspected animal or carcase is located a notice (Form A) declaring the premises to be an infected place and, in consequence, subject to the rules printed on the notice.

Rules of infected place. The rules repeat the requirement to detain the suspected animal or carcase, the prohibition of cutting, etc., referred to already. In addition they prescribe the conditions under which animals may be moved into or out of the infected place. Provided that they are not diseased or suspected of being diseased, horses, asses, mules, and dogs are allowed unrestricted movement. With the same proviso, any other animals may be moved from an infected place with the written permission of an inspector of the local authority, either to a slaughterhouse for immediate slaughter or to other premises, to which infected place restrictions are applied by service of another notice (Form A).

Litter, dung, broken fodder, utensils, etc., may be removed from an infected place with written permission from the Local Authority.

Milk from a suspected cow or goat must not be mixed with other milk. It must be boiled or otherwise sterilised as must be any utensil in which it was kept before it was sterilised.

The term "suspected animal" sometimes causes difficulty. Unless an animal is exhibiting clinical symptoms, including fever, which could be attributed to infection with anthrax, there is no justification for regarding it as a suspected animal even if it has been exposed to risk of infection.

Investigation of suspected cases of anthrax. When the Divisional Veterinary Officer receives notice of suspected anthrax, a Veterinary Officer or a Local Veterinary Inspector, appointed to the selected Diagnostic Panel, is instructed to examine the suspected animal or carcase.

If the veterinary inspector, having considered all available evidence and, in a case involving a carcase, having examined blood smears microscopically, is satisfied that there is no suspicion of anthrax, he gives a certificate to that effect to the Ministry and to the Local Authority, whereupon the infected place restrictions are removed by service of a further notice (Form B).

If the veterinary officer cannot give a negative certificate, he reports to the Local Authority and to the Divisional Veterinary Officer that he suspects that the animal or carcase is affected with anthrax and the case becomes one of suspected disease. When death has occurred, he sends to the Central Veterinary Laboratory of the Ministry at New Haw, Weybridge, unstained smears and a swab prepared from blood from the suspected carcase; in the case of pigs, smears and swabs prepared from peritoneal fluid or the cut surface of a throat lymph node are sent also.

The material submitted is examined microscopically and, if necessary, culturally at the Laboratory. The result of this examination is notified to Animal Health Division Headquarters, Tolworth, whence it is transmitted to the Local Authority, the Divisional Veterinary Officer, the Police, and the owner of the animal.

Disposal of suspected carcase, disinfection, and removal of restrictions. As soon as a report of suspected disease has been given by a veterinary officer or L.V.I., *i.e.* before the result of the laboratory examination is available, the local authority is

required to destroy any suspected carcase by cremation or by chemical agents or, if these ways are impracticable, by burial intact at a depth of not less than 6 feet and to undertake a certain amount of disinfection. If the existence of anthrax is confirmed by the laboratory, disinfection of the infected place as prescribed in the Anthrax Order must be carried out. As soon as this is completed and the carcase has been effectively destroyed, infected place restrictions are removed.

The steps taken to deal with outbreaks of anthrax are designed to prevent or, at least, to minimise the risk of other animals or man contracting the disease. This risk is much increased when there has been cutting of an affected carcase with consequent escape of blood or peritoneal fluids. In a number of outbreaks, affected carcases have reached knackeries and occasionally hunt kennels, where they have been partly skinned and eviscerated before disease is suspected. In a few instances, affected animals have been sent as casualties for slaughter for human consumption.

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THE BENJAMIN WARD RICHARDSON LECTURE

This annual lecture under the auspices of the Royal Society of Health will be delivered on Wednesday, December 16th, 1959, at the Society's Headquarters at 2.30 p.m. It will be entitled "The Breeding and Feeding of Animals for Human Food" by Dr. John Hammond, C.B.E., Emeritus Reader in Agricultural Physiology, School of Agriculture, University of Cambridge.

Links Between Canine Distemper and Rinderpest

BY

J. B. POLDING, RUTH M. SIMPSON, and G. R. SCOTT

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SUMMARY.—An earlier suggestion of a possible immunological relationship between canine distemper and rinderpest was confirmed. While passive immunisation with rinderpest-immune bovine serum barely influenced the course of distemper in dogs, the injection of rinderpest virus increased the resistance of dogs to canine distemper. Increased resistance of cattle to rinderpest was not demonstrated, probably due to the inability of our distemper virus to infect.

Introduction

WE have postulated before on a possible relationship between canine distemper and rinderpest (Polding & Simpson, 1957). Our French colleagues, in confirmatory experiments, were bolder and they concluded that lapinised rinderpest virus completely immunised ferrets against experimental distemper infections and, conversely, that virulent distemper virus completely immunised calves against rinderpest (Goret, Mornet, Gilbert & Pilet, 1958). Our evidence was based on the epidemiological observation that a dog population which was constantly exposed to rinderpest virus remained free from canine distemper. Preliminary experimental findings supported the hypothesis. Dogs given multiple doses of rinderpest virus proved refractory to canine distemper virus which simultaneously induced classical symptoms in control dogs. A belated finding was the discovery of specific rinderpest neutralising antibodies in the sera of *both* groups of dogs following exposure to canine distemper. Since then we have further explored the tenuous links between canine distemper and rinderpest and the results are herein recorded.

Materials

Cattle. The cattle were crosses between East African Shorthorned Zebus and various breeds of European origin, purchased from rinderpest-free areas of Kenya. They were 2 years old and weighed 400 lb. On arrival, each animal was bled for serum which was examined for the presence of rinderpest neutralising antibodies.

Dogs. Distemper-susceptible mongrel puppies were bred and reared on isolated premises 100 miles from the laboratories. When inoculated, they varied from 4 to 6 months of age.

Canine distemper virus. Virulent canine distemper virus, kindly supplied by the Wellcome Research Laboratories, Beckenham, England, was used. The virus was stored until required at minus 20°C. as dried infected tissue in vacuum-sealed ampoules. At the end of the experiments a few of the remaining

ampoules were returned to the Wellcome Research Laboratories where the viability and the virulence of the virus were shown to be unaltered. In addition, spleens from reacting puppies were used as a source of virus.

Rinderpest virus. The Kabete "O" strain of virulent rinderpest virus was used in the inoculation of both cattle and dogs. The virus was stored until required at minus 20°C. as aliquots of infected bovine spleen which contained $10^{5.5}$ fifty per cent. cattle infectious doses per gramme of tissue. The virus used in the rinderpest neutralisation tests was the Nakamura III strain of lapinised rinderpest virus.

Methods

Canine distemper virus in cattle. Two groups of 4 cattle were used. One group was given a single inoculation of canine distemper virus whereas the second group received 3 inoculations at 3-weekly intervals. Both groups together with control cattle were challenged with the Kabete "O" strain of rinderpest 3 weeks after the last distemper exposure. The cattle were bled for serum before and 3 weeks after each inoculation. In addition, cattle given a single inoculation of canine distemper virus were bled 4 days later and the pooled blood was subinoculated into 2 known distemper-susceptible and rinderpest-free dogs.

Rinderpest virus in dogs. Two known distemper-susceptible and rinderpest-free dogs were inoculated subcutaneously with 10.0 ml. Kabete "O" virus containing 30,000 ID_{50} per ml. Simultaneously the viability and virulence of the rinderpest virus was checked in cattle. Four days after inoculation the dogs were bled and the pooled blood injected into a rinderpest-susceptible steer. Three weeks after the rinderpest inoculation the dogs were challenged with canine distemper virus. Serum samples were taken before and 3 weeks after each inoculation.

Rinderpest immune serum in dogs. Five known distemper-susceptible and rinderpest-free dogs were inoculated intravenously with 20 ml. rinderpest-immune bovine serum. Simultaneously 2 similar dogs were injected with rinderpest-susceptible bovine serum. One day later the inoculated dogs, together with control dogs, were given canine distemper virus.

Canine distemper virus in dogs. The presence of rinderpest antibodies was checked in 8 known distemper-susceptible and rinderpest-free dogs before exposure to distemper virus. The presence of rinderpest antibodies was similarly checked in the sera of 2 other dogs, which had recovered from clinical distemper.

Rinderpest neutralisation tests. The Kabete modification of the technique described by Scott and Brown (1958) was used. All sera were inactivated at 56° C. for 30 minutes prior to being tested.

Results

Canine distemper virus in cattle. None of the cattle exhibited a clinical response after inoculation with canine distemper virus. The virus apparently failed to establish in cattle and was not recovered 4 days after inoculation. Neither the cattle given a single inoculation nor the cattle given 3 inoculations developed rinderpest antibodies and all proved to be fully susceptible to rinderpest virus when challenged. The rinderpest challenge reactions were similar to those of the control cattle.

Rinderpest virus in dogs. The preliminary findings were confirmed. The dogs given a single subcutaneous inoculation of rinderpest virus proved refractory to canine distemper virus.

Rinderpest virus was recovered from the dogs' blood withdrawn 4 days after inoculation. The indicator steer given the dogs' blood reacted on the fourth day after inoculation. The peak temperature of 105.6°F. was reached on the fifth day. Other clinical signs such as a nasal discharge and diarrhoea were evident on the tenth day and the animal died on the sixteenth day. The *post-mortem* findings were typical of a virulent rinderpest infection and much more prominent than the expected *post-mortem* lesions associated with the parent Kabete "O" virus. The rinderpest diagnosis was confirmed by the demonstration of the development of specific rinderpest antibodies in the steer's serum.

Despite the recovery of rinderpest virus from the dogs, neither showed a clinical response to the inoculation. Their sera before inoculation did not contain rinderpest antibodies. Three weeks after inoculation the rinderpest antibody titres were high, namely, $10^{3.5}$ fifty per cent. serum neutralising doses per ml.

Rinderpest-immune serum in dogs. Four of the 5 dogs passively immunised with rinderpest immune bovine serum, like the control dogs and those given normal bovine serum, developed typical signs of distemper. The fifth dog was protected for 10 days after which it contracted distemper.

Canine distemper virus in dogs. No rinderpest antibodies were demonstrable in the sera of dogs before exposure to distemper, whereas the 2 dogs which had recovered from clinical distemper had rinderpest antibody titres of $10^{0.8}$ and $10^{1.8}$ SN_{50} respectively.

Discussion

Our previous finding that exposure to rinderpest virus increased the resistance of dogs to canine distemper virus was confirmed. Conversely in cattle canine distemper virus failed to establish and had no effect on their resistance to rinderpest. Goret and his colleagues in French West Africa were apparently successful in protecting 6 calves from rinderpest by the inoculation of virulent canine distemper virus of ferret origin. However, only 2 out of 4 calves were protected after the inoculation of avianised distemper virus (Goret *et al.* 1957; 1958). The evidence suggests, therefore, that strains of canine distemper virus vary in their ability to propagate in cattle, but if they do so, the resistance of the cattle to rinderpest is increased.

The recovery of rinderpest virus from inoculated dogs, its apparently enhanced virulence and the development of rinderpest antibodies to a high level in the dogs, all suggest that multiplication of the virus had occurred. Nevertheless the infections were inapparent. Morcos (1931) on the other hand noted clinical signs and deaths in Egyptian dogs given rinderpest virus.

(*Concluded opposite*)

Bephenium Hydroxynaphthoate—Its Activity Against Nematodirus and Other Trichostrongylid Nematodes in Lambs

BY

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SUMMARY.—Bephenium hydroxynaphthoate has been examined for anthelmintic efficiency against the nematodes causing parasitic gastro-enteritis in lambs.

The methods used and the results obtained are described.

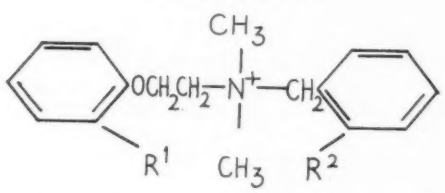
As a result of this work bephenium hydroxynaphthoate is recommended for use in the prevention and treatment of nematodiriasis and other forms of parasitic gastro-enteritis in the unweaned lamb.

Introduction

BEPHENIUM hydroxynaphthoate is one of the series of compounds of the general Formula I which have been shown to have marked activity against a number of nematodes (Copp *et al.*, 1958).

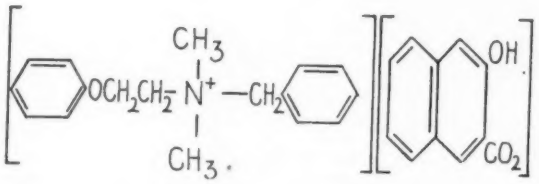
The first drug of the series to be used commercially as an anthelmintic was bephenium embonate which is highly efficient against Nematodirus spp. (Black, 1958; Buntain, 1958; Gibson, 1958; Heath, 1958; Rawes & Scarnell, 1958; Scarnell & Rawes, 1959).

FORMULA I



Bephenium hydroxynaphthoate is benzyldimethyl-2-phenoxyethyl-ammonium (3-hydroxy-2-naphthoate) (Formula II), a pale yellow solid with a.m.p. of 172° to 175° C. and a solubility in water at 20° C. of 0.06 per cent. It has no observed staining properties.

FORMULA II



This paper records our observations on the anthelmintic efficiency of bephenium hydroxynaphthoate against some of the more important trichostrongyles pathogenic to lambs.

Method

The first experiments were completed in 1957 using bephenium hydroxynaphthoate in the form of a finely-milled powder administered *per os* in gelatine capsules at 500, 250 and 125 mg. per kg. to naturally-infested lambs selected on the basis of faecal egg counts, and to a small number of experimentally infected animals.

Field trials were not possible until the spring of 1958 when more extensive observations were made using this salt of bephenium in the form of a dispersible powder administered as a drench. Further assessment of the activity of this preparation was

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Links Between Canine Distemper and Rinderpest —*Concluded.*

The immunological relationship between rinderpest and canine distemper viruses is close but not absolute. Rinderpest antibodies were not present in the sera of dogs before exposure to canine distemper virus but they were detected in recovered dogs at low levels. Nevertheless passive immunisation of dogs with rinderpest-immune serum only delayed 1 out of 5 dogs from clinical distemper.

In recent years several American authors who favour pediatric journals have reported the presence of canine distemper antibodies in human sera. Adams and Imagawa (1957) even go as far as to link canine distemper virus with measles and they present some evidence of cross-neutralisation between the viruses. In East Africa, Plowright and Ferris (1957) have suggested that rinderpest virus possesses links with measles virus on the basis of cytopathological changes in tissue culture. Thus, although tenuous, links are traceable between three widespread viral infections. At this stage speculation is rash but the temptation is great. As a working hypothesis we would suggest that canine distemper, rinderpest and measles represent evolutionary descendants of a parent pathogen of carnivores, ungulates and man respectively.

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subsequently undertaken during the course of routine anthelmintic tests, using selected naturally-infested lambs.

Faecal egg counts were determined using a modified McMaster technique and worm counts by the usual dilution method.

Assessment of the statistical validity of the percentage reductions of the worm burdens was made by setting an arbitrary limit to obtain maximum contrast between treated and control groups. The distribution in numbers of counts in the two groups above and below this limit was then tested for significance by Fisher's exact method for a double dichotomy. For the purpose of this paper, only the data referring to the parasites present in sufficient numbers for the tests to be of value are recorded. Furthermore, unless otherwise stated, the information refers to adults of the species.

Acute toxicity tests were completed on lambs before routine screening for efficiency was started and later the drug was injected directly into the abomasum. Lambs reared worm-free, apart from *Strongyloides papillosus*, were then used to determine the effect of the drug on weight gain. This was also studied in naturally-infested lambs. The "t" test was employed to determine the significance of these results.

Results

In presenting the results the parasites have been grouped as follows :—

(a) Nematodirus spp.
(b) Abomasal Trichostrongyles
(c) Intestinal Trichostrongyles

using 6 lambs randomised on the basis of their faecal Nematodirus egg counts, 3 receiving 500 mg. of the drug per kg., the remainder being maintained as untreated controls. Activity against Nematodirus was marked, as shown in Table I.

A further test, using 250 mg. per kg. was completed in lambs similarly selected and this resulted in a 99 per cent. clearance of adult Nematodirus ($p=0.025$). There were insufficient immature worms in the control animals for evaluation of efficiency to be made.

Field trials of bephenium hydroxynaphthoate against Nematodirus became possible during the early summer of 1958. One hundred lambs, in a flock showing severe clinical signs caused by a mixed infestation of Nematodirus and Ostertagia were selected at random into 2 groups, one received the drug at 250 mg. per kg., the other was not treated. Nematodirus egg counts were reduced practically to zero. Three of the treated lambs and 4 of the controls were slaughtered 5 days after the dose was administered and worm counts at *post-mortem* examination showed almost complete elimination of all stages of Nematodirus. In the course of routine tests similar results have been obtained throughout except for an unexplained failure in one lamb. Relevant data are shown in Table II.

A limited field trial of the drug at 125 mg. per kg. was also carried out using some of the lambs from a flock in which observations on nematodiriasis were being made (Scarnell & Rawes, 1959). There was a high level of activity against all stages of Nematodirus. The data are shown in Table III.

(b) *Abomasal Trichostrongyles*

TABLE I
NEMATODIRUS COUNTS OF UNTREATED LAMBS AND THOSE WHICH RECEIVED BEPHENIUM HYDROXYNAPHTHOATE AT 500 MG. PER KG. BODYWEIGHT

Parasite	Treated (3)* Worm Count at Autopsy		Controls (3) Worm Count at Autopsy		Percentage Reduction	Statistical Significance
	Range	Mean	Range	Mean		
Nematodirus adults	0	0	500—14,620	8,586	100	p=0·05
5th stage	0—100	33	100— 2,758	1,179	97	
late 4th stage	0	0	100— 1,576	672	100	p=0·05
early 4th stage	200	200	2,000— 4,670	3,357	94	p=0·05

* Figure in brackets indicates number of animals in group.

(a) *Nematodirus spp.*

Assessment of the activity of bephenium hydroxynaphthoate against Nematodirus was first made

High activity against adult and immature *Haemonchus contortus* and Ostertagia spp., and against adult *Trychostrongylus axei* was demonstrated fol-

TABLE II
NEMATODIRUS COUNTS OF LAMBS SLAUGHTERED DURING THE FIELD TRIAL OF BEPHENIUM HYDROXYNAPHTHOATE AT 250 MG. PER KG. BODYWEIGHT

Parasite	Treated (3)* Worm Count at Autopsy		Controls (4) Worm Count at Autopsy		Percentage Reduction	Statistical Significance
	Range	Mean	Range	Mean		
Nematodirus adults	0—300	133	25,398—53,865	40,099	99	p=0·03
5th stage	0—100	33	1,254— 5,160	2,485	99	p=0·03
late 4th stage	0—200	66	418— 5,160	2,914	98	p=0·03
early 4th stage	0	0	306—30,372	12,420	100	p=0·03

* Figure in brackets indicates number of animals in group.

TABLE III
NEMATODIRUS COUNTS OF LAMBS SLAUGHTERED DURING THE FIELD TRIAL OF BEPHENIUM HYDROXYNAPHTHOATE AT 125 MG. PER KG. BODYWEIGHT

Parasite	Treated (3)* Worm Counts at Autopsy		Controls (4) Worm Counts at Autopsy		Percentage Reduction	Statistical Significance
	Range	Mean	Range	Mean		
Nematodirus adults	0	0	20,536—32,805	26,833	100	p=0·03
5th stage	0—1,000	334	2,128— 5,738	4,000	92	p=0·03
late 4th stage	100—900	400	302— 2,912	1,386	71	
early 4th stage	0—600	267	2,102—11,418	6 576	95	p=0·03

* Figure in brackets indicates number of animals in group.

TABLE IV
ABOMASAL WORM COUNTS OF LAMBS USED IN A TEST OF BEPHENIUM HYDROXYNAPHTHOATE AT 250 MG. PER KG. BODYWEIGHT

Parasite	Treated (3)* Worm Count at Autopsy		Controls (3) Worm Count at Autopsy		Percentage Reduction	Statistical Significance
	Range	Mean	Range	Mean		
H. contortus	0—400	134	3,500— 7,790	5,470	97·5	p=0·05
Immature	100—600	300	1,400— 4,690	3,560	92	p=0·05
Ostertagia spp.	300—2,300	967	1,600— 8,040	4,573	79	
Immature	0—300	100	1,000—10,710	6,583	98·5	p=0·05
T. axei	0—100	33	400— 8,710	3,547	99	p=0·05

* Figure in brackets indicates number of animals in group.

lowing dosage with bephenium hydroxynaphthoate at the 500 mg. per kg. level.

Six lambs were used for a general anthelmintic test at 250 mg. per kg. and the results are shown in Table IV. Two further tests were completed, in one a complete clearance (p=0.05) of Ostertagia spp. (adult and immature) was achieved whilst in the other there was a failure in one lamb. Activity against *H. contortus* and *T. axei* was similar to that shown in the first assessment. A test carried out in lambs experimentally infected with *H. contortus* resulted in an 88 per cent. clearance (p=0.05).

This salt of bephenium was examined at 125 mg. per kg. and the results obtained are shown in Table V. Activity was high against Ostertagia spp. and *T. axei* but slightly less than that of 250 mg. per kg. of assessment of activity, since efficiency against Ostertagia was clearly demonstrated by worm counts at autopsy. Three of the treated lambs and 4 of the controls were slaughtered 5 days after the dose was administered and worm counts at *post-mortem* examination showed almost complete elimination of Ostertagia spp. The relevant data are shown in Table VII. In the field trial of the drug at 125 mg. per kg. a moderate level of efficiency against Ostertagia spp. was demonstrated.

Marked improvement in the efficiency of bephenium hydroxynaphthoate against *Ancylostoma caninum* and *Uncinaria stenocephala*, the hookworms of the dog, occurs when the dose is divided and administered morning and evening (Rawes, 1958). This method was therefore examined in sheep by

TABLE V
ABOMASAL WORM COUNTS OF UNTREATED LAMBS AND THOSE WHICH RECEIVED BEPHENIUM HYDROXYNAPHTHOATE AT 125 MG. PER KG. BODYWEIGHT

Parasite	Treated (7)* Worm Count at Autopsy		Controls (7) Worm Count at Autopsy		Percentage Reduction	Statistical Significance
	Range	Mean	Range	Mean		
Ostertagia spp.	0—1,000	329	0— 9,222	2,782	88	
T. axei	0—2,500	686	500—20,300	5,401	87	p=0·01

* Figure in brackets indicates number of animals in group.

During the field trial to test bephenium hydroxynaphthoate against Nematodirus the opportunity was taken to determine its efficiency against Ostertagia spp. A group of 50 lambs received 250 mg. per kg., a similar group was maintained as an untreated control. The average faecal egg counts (other than Nematodirus) before and after treatment are shown in Table VI. These counts unlike those of Nematodirus were not markedly reduced, and emphasise one of the limitations of this method comparing a single dose of 250 mg. per kg. bephenium hydroxynaphthoate with 2 doses each of 125 mg. per kg. There was an indication that the single dose was more active but the difference was not statistically significant.

(c) *Intestinal Trichostrongyles*

Throughout the tests described above observations were made on the activity of the hydroxynaphthoate against *Cooperia curticei*, *Trichostrongylus colubriformis* and *Trichostrongylus vitrinus*. Almost com-

TABLE VI
AVERAGE FAECAL EGG COUNTS OF LAMBS IN THE FIELD TRIAL OF BEPHENIUM HYDROXYNAPHTHOATE AT 250 MG. PER KG. BODYWEIGHT

Treatment	8.7.58* Trichostrongyles (other than Nematodirus) e.p.g.†	15.7.58 Trichostrongyles (other than Nematodirus) e.p.g.
250 mg. per kg. bephenium hydroxynaphthoate ...	288	181
Controls	266	304

* Immediately before treatment.
† Eggs per gramme of faeces.

TABLE VII
ABOMASAL WORM COUNTS OF LAMBS SLAUGHTERED DURING THE FIELD TRIAL OF BEPHENIUM HYDROXYNAPHTHOATE AT 250 MG. PER KG. BODYWEIGHT

Parasite	Treated (3)* Worm Count at Autopsy Range	Mean	Controls (4) Worm Count at Autopsy Range	Mean	Percentage Reduction	Statistical Significance
Ostertagia spp.	0—600	300	6,432—21,560	13,077	98	p=0·03
Immature	0—200	100	134— 2,384	1,407	93	

* Figure in brackets indicates number of animals in group.

plete clearance of *C. curticei* was obtained at all dose levels, but that of the Trichostrongylus spp. was very variable ranging from 0 to 91 per cent.

Following a test in which the compound was injected at 500 mg. per kg. into the abomasum in 2 lambs, in which no signs of toxicity were observed, worm counts were carried out on these animals and on 2 untreated controls, the results being shown in Table VIII.

TABLE VIII
MEAN INTESTINAL WORM COUNTS OF LAMBS IN TEST OF BEPHENIUM HYDROXYNAPHTHOATE AT 500 MG. PER KG. BODYWEIGHT ADMINISTERED BY INJECTION INTO THE ABOMASUM

Parasite	Mean Worm Count at Autopsy Treated(2)*	Controls (2)
T. colubriformis	300	1,300
T. vitrinus	450	1,750
C. curticei	0	650

*Figure in brackets indicates number of animals in group.

An increased efficiency against *T. colubriformis* and *T. vitrinus* was indicated though this was not of statistical significance. In an attempt to ensure a similar direct passage of the drug to the abomasum following oral administration, 250 mg. per kg. was given 10 seconds after 10 ml. of 10 per cent. copper sulphate solution (Watson & Jarrett, 1944). The results are shown in Table IX. The activity of the drug administered in this manner was negligible against *T. colubriformis* and *T. vitrinus*.

A summary of the results obtained during the tests of 250 mg. per kg. bephenium hydroxynaphthoate, administered both as a finely-milled and as a dispersible powder, is shown in Table X. This emphasises the high level of activity of the drug against *H. contortus*, Ostertagia spp., *T. axei*, *C. curticei* and all stages of Nematodirus spp., which in these tests were predominantly *N. filicollis*.

No clinically recognisable signs of toxicity have been observed in 250 lambs treated with single oral doses of bephenium hydroxynaphthoate ranging from 125 to 2,000 mg. per kg., nor following the injection of 500 mg. per kg. directly into the abomasum. However, some toxicity has been noted by Gordon (1958) using the latter dose and method of administration but in animals which were debilitated as the result of severe parasitic gastro-enteritis.

To determine the effect of the drug on growth rate, 10 lambs reared worm-free execept for *S. papillosus* were selected at random by weight into a control undosed group and a group which received 3 doses of 250 mg. per kg. at fortnightly intervals. The experiment was completed 2 weeks after the third dose was administered and by this time the weight gain of the treated lambs was less

TABLE IX
INTESTINAL WORM COUNTS OF LAMBS USED IN ASSESSING ACTIVITY OF 250 MG. PER KG. BODYWEIGHT BEPHENIUM HYDROXYNAPHTHOATE ADMINISTERED 10 SECS. AFTER 10 ML. OF 10 PER CENT. COPPER SULPHATE SOLUTION

Parasite	Treated (4)* Worm Count at Autopsy Range	Mean	Controls (4) Worm Count at Autopsy Range	Mean	Percentage Reduction
T. vitrinus	300—6,716	2,904	600—7,696	2,672	0
T. colubriformis	300—1,200	637	100—2,204	834	24

* Figure in brackets indicates number of animals in group.

TABLE X
SUMMARY OF RESULTS OF TESTING BEPHENIUM HYDROXYNAPHTHOATE AT 250 MG. PER KG. BODYWEIGHT DURING WHICH WORM COUNTS WERE CARRIED OUT ON 35 DOSED LAMBS AND 34 CONTROLS

	All results		Statistically Significant results	
	Percentage reduction		Percentage reduction	
Parasite	Range	Mean	Range	Mean
H. contortus	88—100	96	88—100	96
Immature		92*		92*
Ostertagia spp.	44—100	77	98—100	99
Immature	93—100	97	98—100	99
T. axei	71— 99	88	88— 99	93
T. vitrinus	0— 91	32	No significant results	
T. colubriformis	0— 85	37	No significant results	
C. curticei	89—100	97	100†	100
Nematodirus spp.	34‡—100	88	99—100	99·5
Larval stages		99*		99*

* One result.
† Complete clearance in all tests.
‡ Failure in one lamb.

than that of the control lambs but this difference did not reach significance. The results are shown in Table XI. This effect was not observed in

TABLE XI
GROWTH RATE OF "WORM FREE" LAMBS RECEIVING 250 MG. PER KG. BODYWEIGHT BEPHENIUM HYDROXYNAPHTHOATE AT FORTNIGHTLY INTERVALS AND OF UNTREATED CONTROLS

	Dosed	Controls
Initial average weight (lb.)	39·6	37·6
Final average weight (lb.)	44·0	45·6
Average live-weight gain during experiment (lb.)	4·4	8·0

numerous field trials in one of which the weight gain of lambs which received 250 mg. per kg. bephenium hydroxynaphthoate twice with an interval of one month between doses was compared with that of untreated animals. One month after the second dose was administered the lambs which received the drug showed a marked increase in weight gain compared with the controls, and the data are shown in Table XII. Unfortunately initial average weights of the groups were substantially different but this result shows that there was no depression in weight gain following the administration of this salt of bephenium.

TABLE XII
GROWTH RATE OF LAMBS IN FIELD TRIAL TO COMPARE UNTREATED ANIMALS WITH THOSE WHICH RECEIVED 250 MG. PER KG. BODYWEIGHT BEPHENIUM HYDROXYNAPHTHOATE

	250 mg. per kg. (10)* Bephenium hydroxynaphthoate	Controls (12)
Initial average weight (lb.)	55·2	62·1
Final average weight (lb.)	70·8	72·8
Average live-weight gain during experiment (lb.)	15·6	10·7

*Figure in brackets indicates number of animals in group.

Discussion

It has been reported that bephenium hydroxynaphthoate is more active than bephenium embonate against hookworms in man and dogs (Burrows, 1958; Goodwin, Jayewardene & Standen, 1958) and several other nematodes in laboratory animals (Standen & Keeling, 1958).

The high activity of bephenium embonate against Nematodirus originally reported by Rawes and Scarnell (1958) has been confirmed by subsequent trials against *N. filicollis* and *N. battus* but markedly varying results have been obtained in tests of this salt against the other nematodes causing parasitic gastro-enteritis in lambs. This is illustrated in Table XIII

TABLE XIII
SUMMARY OF RESULTS OF TESTING BEPHENIUM EMBONATE AT 250 MG. PER KG. BODYWEIGHT DURING WHICH WORM COUNTS WERE CARRIED OUT ON 44 DOSED LAMBS AND 42 CONTROLS

	All results		Statistically Significant results	
	Percentage reduction		Percentage reduction	
Parasite	Range	Mean	Range	Mean
H. contortus	4—100	70	88—97	93
Immature		0*	No significant results	
Ostertagia spp.	0— 98	36		98*
Immature	0— 37	12	No significant results	
T. axei	47—100	77	No significant results	
T. vitrinus	0— 83	40	No significant results	
T. colubriformis	0— 76	30	No significant results	
C. curticei	95—100	99	95—100	99
Nematodirus spp.	92—100	98	92—100	95
Larval stages	94— 97	96		97*

* One result

which summarises the results of all the tests of bephenium embonate at 250 mg. per kg. When compared with the similar results obtained from tests of bephenium hydroxynaphthoate which were shown in Table X, the greater activity of the latter compound is clearly demonstrated. The efficiency against Nematodirus spp. is retained so that this salt can be recommended for the prevention and treatment of nematodiriasis in lambs.

Since the intestinal Trichostrongylus spp. only become of pathogenic importance in older lambs (Morgan *et al.* 1951; Parnell, 1954) bephenium hydroxynaphthoate at 250 mg. per kg. appears to be the most active anthelmintic at present available for use against the nematodes commonly infesting unweaned spring-born lambs.

Acknowledgments.—We should like to express our thanks for the help received.

(1) From numerous colleagues in the Wellcome Foundation, particularly Mr. S. L. Hignett, Mr. D. Stephenson, Mr. P. A. Young, Dr. P. Clapham, Miss A. J. Bescoby, Miss G. Harland, Miss W. A. Morley, Miss G. C. Young, Miss G. Wrapson and Mr. C. Ovenden,

(2) from Mr. J. D. Paterson, M.R.C.V.S., Mr. G. S. Peyton, M.R.C.V.S., Mr. P. M. F. Sambrook, B.SC., M.R.C.V.S., who put us in touch with infected flocks, and

(*Concluded overleaf*)

Current Literature

BOOK REVIEWS

The Principles of Humane Experimental Technique. W. M. S. Russell and R. L. Birch (1959). Methuen & Co. Ltd., London. 30s.

The necessity for emphasising the principles set out in this book is urgent, and the Universities Federation for Animal Welfare is to be congratulated on sponsoring such a work, which will have to be kept rigidly up to date.

Its layout is logically centred around the survey of laboratory animals in Great Britain, previously made and analysed by W. Lane-Petter. The philosophical arguments in the introductory chapters are somewhat difficult reading, but the methods of improving animal experimentation discussed in the later chapters, Replacement, Reduction, and Refinement, are well worth a careful study.

Particular attention should be drawn to an excellent bibliography, with which one fault only may be found. Long lists of names disrupt a philosophical argument and are the chief cause of any difficulty that may be experienced in its reading. Further, the grouping of the numerical tables at the end of the book is debatable. Their present position is to be preferred for reference, but for easy reading tables in the text are a necessity.

As for the survey and its analysis, this is already well known to most of those who work with animals and the extra information which has been derived should serve to increase its usefulness. The practical application of the humane principles of replacement, reduction, and refinement, which is now being actively pursued in most of the leading pharmacological laboratories and in University and hospital laboratories, will be stimulated by the excellent examples quoted. When all scientific workers aim at the replacement of laboratory animals and, if this is impossible, design experiments with the view to using the least number of animals of the correct species and strain, then the object of the book will have been fulfilled.

It is essential that none, graduates or technicians, who read this book, should be so discouraged by its deep philosophy as to relegate it to the shelves merely for reference. If the principles of humane technique had been supported by some reference to the Divine, perhaps the philosophical arguments would have been more simple. In the law given to Moses insentient humanity had a great place, for it says: "Thou shalt not seethe a kid in his mother's milk" (Ex. 23, V. 19). By order of the same law, on the great day of atonement, one goat only was needed to carry the people's sin into the wilderness (Lev. 16, V. 21)—surely a reduction in numbers! Finally, in the words of wisdom from King Solomon, "A righteous man regardeth the life of his beast: but the tender mercies of the wicked are cruel" (Prov. 12, V. 10).

Regional and Applied Anatomy of the Domestic Animals. Part 2. By JOHN A. TAYLOR, F.R.C.V.S. (1959). Oliver and Boyd, Edinburgh. 27s. 6d.

The second part of John A. Taylor's "Regional and Applied Anatomy of the Domestic Animals" is devoted to the thoracic limb. The binding has been reinforced since Part 1 was published, which gives the book a more conventional appearance.

The general presentation follows the pattern of Part 1 (head and neck) and consists of a series of 52 illustrations supported by an explanatory and informative text. The illustrations are of a high standard and their value enhanced by placing the drawing of the regional dissection side by side with an external view of the area concerned. The distribution of the nerves of the brachial plexus in the dog are most effectively shown against a simplified background. Fig. 30 is misleading as it gives the erroneous impression that the radial nerve crosses the humerus on its medial aspect.

In view of the importance of cattle in the national economy, and of the problems associated with regional analgesia and surgery of the digit, it seems beggarly to allot only 7 pages out of 200 to the anatomy of the forelimb of the cow, and at the risk of pedantry, why call a dog a dog, a horse a horse, but a cow . . . a bovine?

Mr. Taylor has produced a book, which by putting anatomy in a nutshell, will certainly have the greatest appeal to anyone, be he under- or post-graduate, who wants maximum information for the minimum of effort.

Implantation of Ova. Memoirs of the Society for Endocrinology. No. 6. Edited by P. ECKSTEIN (1959). Cambridge University Press, London. 30s.

(*Concluded at foot of col. 1 overleaf*)

Bephenium Hydroxynaphthoate—*Concluded.*

(3) from Mr. C. Jessel, Mr. E. J. Spanton and Mr. J. Starkie who provided the facilities for the field observations.

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B.V.A. Standing Committees for 1959—60

A meeting of the Nominations Committee, consisting of the Officers, and Chairmen of Standing Committees, was held at 7, Mansfield Street, on August 5th.

Lists had been circulated showing the attendances of members during the year 1958-9 and also the names of members recommended by Divisions to serve on particular committees. After full consideration, the following nominations were made, the wishes of Divisions being taken into account. (Officers of the Association are members, *ex officio* of all Standing Committees.)

General Purposes and Finance Committee

(20 members, plus past-Presidents and Chairmen of other Standing Committees)

Anderson, K. P., Atkinson, G., Beeson, A. J., Bell, F. R., Beynon, A. G., Black, N. M., Brancker, Miss W. M., Bywater, H. E., Hardwick, E. F., Hughes, D. L., Joshua, Miss J. O., Moss, J. A., Oliver, D. F., Pearson, J. K. L., Pugh, P. D. S., Tullis, G., Tweed, W., Uvarov, Miss O., White, J. B., and Wyse, G.

Reserves: John, F. V., Steele-Bodger, A., Edwards, J. B., Adams, A. J., Davies, D. E., Dixon, A. C., and Phillips, R. N.

Technical Development Committee

(26 members)

Beaumont, G. L., Brancker, Miss W. M., Bruford, J. S., Crowhurst, F. A., Dall, J. A., Gordon, W. S., Gould, G. N., Ingram, J. M., Inglis, J. S. S., John, F. V., King, J. O. L., Loosmore, R. M., Montgomerie, R. F., McIntyre, W. I. M., Pittaway, E. M., Pugh, P. D. S., Robertson, A., Rowlands, W. T., Sellers, K. C., Stableforth, A. W., Taylor, E. L., Towers, K. G., White, J. B., Wilkinson, G. T., Wilson, A. L., and Wooldridge, W. R.

Reserves: Oliver, D. F., Laugier, G. V., Wright, A. J., and Hughes, L. E.

It is recommended that this Committee be empowered to co-opt.

Veterinary State Medicine Committee

(20 members)

Atkinson, G., Beattie, I. S., Beynon,, A. G., Callender, E. R., Chapman, A. S., Edgar, J., Edwards, J. B., Hardwick, E. F., McGrath, R. E., Male, N. P., Mitchell, P. J., Perkins, L. E., Pettett, D. W. S., Powley, G. S., Searles, G. W., Sutherland, A., Tweed, W., Waddington, F. G., Wilkinson, E., and Wood, S. W.

Reserves: O'Sullivan, K., and Loosmore, R. M.

Farm Livestock Committee

(20 members)

Arthur, G. H., Brown, A. C. L., Brown, G. F., Buckler, G. K., Chambers, F., Ford, E. J. H., George, I. G., Golledge, I. St. Bel, Heath, G. B. S., Hector, A., Holroyd, H., Howell, D. G., John, F. V., Loxam, J. G., McGhee, J. H., Pettett, D. W. S., Stewart, D. L., Wilkinson, E., Wright, A. J., and Wylie, R. L.

Reserves: Wood, S. W., and Adams, J. A.

Parliamentary and Public Relations Committee

(20 members)

Barnett, G., Bell, F. R., Black, N. M., Callender, E. R., Edwards, J. B., Forster, J., Hall-Patch, P. K., Henderson, G. N., Hughes, D. L., Jones, O. G., Kelly, Mrs. K. G. R., Kidd, A. A., Massey, R., Nicholson, D. S. S., Pasfield, J., Perkins, L. E., Sutton, E. G., Thomson, A., Uvarov, Miss O., and Wooldridge, W. R.

Reserve: Hickman, J.

Home Appointments Committee

(20 members)

Clabby, J., Davies, G. O., Dudlyke, R., Dyce, K. M., Edwardson, J., Gordon, F. A., Graham, A. M., Holman, H. H., Howell, D. G., Lewis, D. G., Luke, D., Moss, J. A., McGhee, J. H., Pattison, I. H., Rowson, L. E., Steele-Bodger, A., Sutherland, A., Taylor, A. M., Tillemont-Thomason, Miss V., and Tullis, G.

Reserves: Bushman, G. N., and McIntyre, W. I. M.

Small-Animals Committee

(20 members)

Adams, A. J., Alexander, F., Bushman, G. N., Bywater, H. E., Campbell, R. S. F., Dalby, Miss M., Freak, Miss M. J., Hall, I. G., Hickman, J., Hodgman, S. F. J., Jones, B. V., Lauder, J. S. J., Laugier, G. V., Lewis, D. G., Oliver, D. F., Oliver, G. M. G., Startup, F. G., Thomson, A., Tillemont-Thomason, Miss V., and Woodrow, C. E.

Overseas Committee

(15 members)

Bell, F. R., Carmichael, J., Chalmers, A. W., Crawford, M., Cronly, H., Fisher, R. C. U., McKay, W. M., Marshall, R. S., Phillips, R. N., Piercy, S. E., Pool, W. A., Smith, D. F. G., Waddington, F. G., Wells, C. W., and Ware, Sir Frank.

Reserves: Simpson, S., and Beaton, W. G.

Editorial Committee

(6 members)

Bell, F. R., Freak, Miss M. J., Harbour, H. E., Ingram, J. M., Joshua, Miss J. O., and Pattison, I. H.

Reserves: Hughes, D. L., and Barron, N. S.

It is recommended that this Committee be empowered to co-opt.

Implantation of Ova—*Concluded.*

The book reports the proceedings of a high-level conference held to survey and discuss that phase of mammalian development covering the process of ovum implantation in the uterine endometrium including its biochemical, pharmacological, and hormonal implications.

It is in the form of a series of communications many of which are previously unpublished data, and each communication is followed by discussions which are reported verbatim.

While several of the communications deal with laboratory animals the general implications of the findings are of considerable interest.

The memoir opens with a survey of the physiology of ovum implantation in mammals which provides the background to the subsequent papers which apart from communications on specific laboratory species deal with the biochemistry of implantation, the spacing of implantations, delayed implantation, the inhibition of pregnancy, and the rôle of histamine in nidation. The communications are followed by a general discussion covering the whole range of subjects.

This book will appeal to the research worker interested in the fundamental processes of reproduction, but is of too fundamental a nature to be of particular interest to the veterinary surgeon.

The Annual General Meeting

The 77th Annual General Meeting was held in the Hotel Metropole, Folkestone, at 12 noon, on August 31st, 1959. The President, Mr. H. F. Hebeler, was in the Chair.

The General Secretary (Mr. F. Knight) read the notice convening the Meeting.

The President announced that, early that morning he had caused a telegram to be sent to Her Majesty the Queen at Balmoral Castle, with the following message:—

"Members of the British Veterinary Association attending the Opening Session of their 77th Annual Congress send to Your Majesty, as their Patron, loyal greetings and their humble duty.

(Signed) H. F. Hebeler, President."

The following reply had been received:—

"The Queen sincerely thanks the members of the British Veterinary Association attending their Annual Congress for their loyal greetings which Her Majesty, as Patron, greatly appreciates.

(Signed) Private Secretary."

The President then delivered the traditional Address to the Association, as published in THE VETERINARY RECORD on September 5th. At its conclusion, Mr. J. McC. Ingram (senior vice-President), on behalf of the meeting, thanked the President and said he thought this Address was a fair measure of the expeditious manner in which the President had performed his many duties and the efficient way that the whole work of the Association had gone forward. He hoped that a slight note of envy had not been detected in his voice, because last year he had had to drive the bigger half of his listeners to the meeting. He must admit that keeping a horse-drawn tram on a straight line was easier than keeping the affairs of the Association going! He felt sure that all would agree they had heard a wonderful résumé of the year's work and an outstanding presidential Address. (*Applause.*)

Meeting Places for 1960 and 1961

The President said that it had already been agreed that the Annual Meeting and Congress for 1960 would be held in Glasgow, and it was the recommendation of Council, following on the discussion which had taken place last year, that the Annual Meeting and Congress for 1961 should take place in Oxford. He therefore proposed that the Annual Meeting and Congress for 1960 be held in Glasgow and that for 1961 in Oxford.

Dr. H. Holman, in seconding the proposal, said that he was very proud to be a member of the Royal Counties, and they were very enthusiastic about this proposal. In fact, as evidence of their sincerity, they had doubled their annual subscription, although after the very wonderful hospitality from the local Divisions in Folkestone, he was wondering whether that would be enough! He gave an assurance that they would do their best to make the Congress in Oxford a success.

Mr. Baillie Russell, on behalf of the local authority in Glasgow, said that the Congress would be well received in Glasgow. There was a famous song, "I Belong to Glasgow," and he hoped that at the end of their Congress in Glasgow members would feel that they too belonged to Glasgow because of the welcome that had been given to them.

The proposal was *unanimously agreed*.

The President announced that Council, at its meeting on Sunday, night, had considered an invitation from the Town Council of Scarborough, supported by the Yorkshire Division, that the Congress for 1962 be held in Scarborough. The present Annual General Meeting was not in a position under the Articles of Association to make that decision now, but it would be brought before the Annual General Meeting next year.

Election of President for 1959/60

The President said that the unanimous recommendation of Council was that Mr. S. L. Hignett should be President for the ensuing year. (*Applause.*) This moment was one that he had been looking forward to for a long time for the particular pleasure and honour he felt in making this formal proposal to the Annual General Meeting.

Mr. Hignett must be so well known to so many members of the Association that he had some hesitation in sketching his attributes, for fear that he might be accused of leaving something out. But if one took a countryman from Shropshire, with an inborn love of nature, an inquiring mind, and the ability to use it, gave him a veterinary training and followed it up with teaching and research experience, and then placed him in charge of a research station with wide terms of reference and some practical farming to keep him occupied in his spare moments —there one had Sam Hignett.

If one added to that experience overseas on Government and University inquiries on the most diverse subjects, his most valuable help to the Survey Committee of the Association and subsequent membership and distinguished Chairmanship of the Technical Development Committee, combined with an extraordinary attendance as an author at Divisional meetings and acting as the driving force behind the now famous refresher courses at Frant—one would understand why he felt he could paraphrase the description of Kipling's Kim—"little friend of all the (veterinary) world."

In the hands of a man with that record of service, who was at home with his colleagues in all branches of their work, with research workers in many other fields, and with farmers, the Association must attain even greater recognition; and they were fortunate that he was able and willing to take office.

It was with the very greatest satisfaction, the President said, that he proposed that Mr. S. L. Hignett be elected President for the next year.

Dr. R. F. Montgomerie, who seconded the motion, said that it might be known to many members that Mr. Hignett and he had been associated in their work as friends and colleagues for a period of well

nigh 20 years. Some of them might think, looking at Mr. Hignett, that that period had worn Mr. Hignett less than it had worn himself. If for one moment they thought that, he could tell them that the boot had been on the other foot.

During that period he had come to know the characteristics and the qualities of Mr. Hignett as few of them could do. He would not speak of them all; the President had very properly sketched them; but of those characteristics one was that Mr. Hignett was very appreciative of any honour that came his way—many had, of course, and all of them well deserved.

Of Mr. Hignett's abilities he would say very little, although he could say much, but one thing they did know was that if one gave Mr. Hignett a job, he would do it and do it well. To-day, if Mr. Hignett were elected President, he would be given a job which had grown in stature over the years, and a job which the present President had made no more easy by the quality which he had brought to it during the past year. However, there was a job for Mr. Hignett, a job which, with his abilities, his very able head, and very hard-working pair of hands, he would execute for the Association in a most efficient way.

The President had referred to the fact that Mr. Hignett was well known to members. He doubted whether there was a member of the profession who, through his service to all members in the various branches, had made himself so well known and so popular. He had great pleasure in seconding the motion, which he expected to be carried with a great deal of enthusiasm.

The President then put the motion to the meeting, and it was *carried unanimously*, amid acclamation.

Mr. S. L. Hignett expressed his sincere thanks to the President and to Dr. Montgomerie for the very kind, flattering, and quite undeserved remarks they had made. He thanked the members of the Association for the way in which they had endorsed the proposal. For his part, he would endeavour to justify their confidence by striving at all times to further the aims and objectives of the British Veterinary Association.

Presentation of the Dalrymple-Champneys Cup and Medal

The President said that unfortunately Sir Weldon Dalrymple-Champneys was unable to be present to-day and he had sent his apologies. This was the 24th award, the Cup and Medal having been instituted in 1934, but no award having been made in 1939. The Prize was given to mark work, published or unpublished, which it was considered would encourage the advancement of veterinary science. The awarding Committee this year had unanimously decided that the award should be made to Dr. A. T. Phillipson, M.A., M.R.C.V.S., F.R.S.E., Deputy Director of the Rowett Research Institute, in recognition of his outstanding merits as a veterinary physiologist and the contribution he had made, as well as the influence he had exerted, in the advancement of this subject.

After graduating from the Royal Veterinary College and having taken a post-graduate course at University College, London, Dr. Phillipson had been appointed to the staff of the Institute of Animal Pathology at Cambridge when Sir Thomas (then Dr.) Dalling was the Director, and had carried out work on the mechanics of the reticulo-rumen under Sir Joseph Barcroft and later studied the products of rumen digestion and their absorption.

On the formation of the Agricultural Research Council's Unit of Animal Physiology at Cambridge with Barcroft as Director, Dr. Phillipson had become a leading member of the team which had done the classical work showing the importance of the lower fatty acids in ruminant digestion.

In 1947 he had been appointed Head of the Physiology Department of the Rowett Research Institute and more recently Deputy Director. His work there on ruminant digestion had been of outstanding merit and had attracted research workers from all over the world to join him and so advance further the great name of the Rowett.

Dr. Phillipson's eminence in his chosen field had been enhanced by his visits overseas to study animal physiology and had been recognised by his election as a Fellow of the Royal Society of Edinburgh and the award of an Honorary Doctorate of Veterinary Medicine of the Royal and Agricultural College at Copenhagen.

This international recognition of his work in a discipline which, only a short time ago, had attracted few veterinary workers had gone far to raising the esteem of the profession in the widest field of science, and for this they thanked Dr. Phillipson and wished him every success in the future.

(The President then presented the Cup and Medal to Dr. Phillipson, amid loud applause.)

Dr. A. Phillipson thanked the President for the extremely kind things he had said, and also thanked him and the Committee for having done him the very great honour of awarding him the Cup and Medal for the year 1959.

He sometimes thought that in a profession such as theirs, one's professional colleagues were one's most severe critics, and the fact that it had been thought fit to award him the Cup and Medal made him even more appreciative of the value of the award. Frankly, he did not know that he was as eminent as all that, nor did he believe it; but it was very nice to have the award. When he had started on this particular line of country it had been rather limited in some ways, and this award now made him feel it was accepted, and this made the award very much worth while.

The Harry Steele-Bodger Memorial Travelling Scholarship

The President announced that the Committee concerned with this award had decided that no award should be made this year.

Election of Professor E. C. Amoroso as an Honorary Member of the Association

The President moved that approval be given to the following recommendation of the Council:—

"That Professor E. C. Amoroso, PH.D., B.SC.,

M.B., B.CH., B.A.O., F.R.S., HON. A.R.C.V.S., be elected an Honorary Member of the Association."

It was, he said, a happy coincidence that to-day two eminent workers in a fundamental science were honoured. After graduating in medicine, Professor Amoroso had undertaken a wide post-graduate training both on the Continent and in London. His appointment to the staff of the Royal Veterinary College 25 years ago, culminating in the Chair of Physiology in 1948, had led to a long and happy connexion with their profession which held him in high esteem. His great interest in the veterinary profession might be gauged by the fact that he had become a registered veterinary student in 1935 and, the President believed, had gained the highest mark ever recorded in the Animal Management examination. This might be the reason why he had not proceeded to the final examination, and it had not been until he was made an Hon. A.R.C.V.S. in May of this year that they could hail him as a veterinary surgeon. Surely 24 years as a student must be a record which would endear him all the more to the student body and to all of them!

Since 1950 Professor Amoroso had held a number of important visiting professorships to the Universities of Berlin, Harvard, and Washington, and had given invitation lectures to an even larger number.

Professor Amoroso's interests had always extended to the limits of the classical field of physiology and beyond, and his eminence as a scientific worker had been recognised in 1957 by the high honour of election to the Fellowship of the Royal Society, an election which had given particular pleasure to the whole profession.

Professor Amoroso had an enviable command of foreign languages, and his entry at sectional meetings at the Madrid Congress had been greeted with sighs of relief and applause when official interpreters were struggling with points of technical difficulty; withal he had that rare gift, a mastery of the English language.

The award of Honorary Membership was one which the Association rarely made, but in so honouring their friends they also honoured themselves, and it was with very great pleasure that he proposed, on the unanimous recommendation of Council, that Professor E. C. Amoroso—veterinary surgeon and friend of the profession—be elected an Hon. Member of the British Veterinary Association. (*Applause.*)

Mr. S. Jennings, who seconded the proposal, said that when the Council of the British Veterinary Association conceived the idea of asking Professor Amoroso to accept Honorary Membership, it had had no idea that the Royal College of Veterinary Surgeons was also contemplating making him an Honorary Associate of the R.C.V.S. However, as things had turned out, it was most appropriate, for Professor Amoroso could at any time now in his own right as a veterinary surgeon apply to the Association for membership. But they did not want it to be that way. When St. Paul was challenged by the Roman captain because St. Paul had hinted that he was a Roman, the captain said, "Wert thou a Roman?" And when St. Paul said that he was, the captain said, "With a great sum obtained I this"; and St. Paul said, "But I was free born." That was how they wanted it to be with Professor Amoroso.

He was not suggesting for one moment that the position that Professor Amoroso held in the scientific world had been without cost, for indeed it had cost him years of toil, and the results of his labours had been given freely to all mankind. It had indeed cost him much, but the British Veterinary Association wanted him to be free born.

The Congress was described, rightly, as a scientific gathering, but it was also a great social occasion, and they had many pleasures in store, but none greater than the pleasure that they had set aside for themselves to-day in asking Professor Amoroso, whom they held in such high esteem, to be an Honorary Member of the Association. They were not unmindful of the fact that Professor Amoroso had been honoured by very learned societies, and in asking him to be an Honorary Member they also extended to him a hand of friendship. They were not claiming that they were unique in this respect, but they did say that they specialised in friendship. Professor Amoroso had been a friend of the profession for a long time; he had been waist-deep in the profession, and now they would like to see him up to the eyes in it.

The President then put the proposal to the meeting, and it was *carried unanimously*, after which the President, amid applause, presented the scroll of membership to Professor Amoroso and welcomed him.

Professor Amoroso, in response, said how greatly appreciative he was to the President, the Council, and the members for so electing him to this rare honour. Could any man's ambition desire more than the admiration of his friends and his colleagues as evidenced by the award of a title which, as the President had said, had been so rarely awarded to individuals? To him it was particularly refreshing, because he understood that he was the first Associate of the R.C.V.S. to be so honoured. But in accepting it he must confess to a little apprehensiveness lest the President and Mr. Jennings might, by very high promise, have engendered hopes which he feared he might be unable to fulfil. The President-Elect, when telling him of the decision of the Council some time ago, had said that this was due primarily to the fact that this was a means of controlling him! Well, there was no need to control something unless it was very buoyant; he hoped that his buoyancy would continue! He would continue to hold the profession in high esteem, and to be a member of the Association was to him a very great and signal honour.

The President then closed the public proceedings of the Annual General Meeting.

Annual Report and Balance Sheet

The President, in moving the adoption of the Annual Report and Balance Sheet, said that these had been circulated to members in the form of a brief printed circular; unfortunately, owing to the printing strike, it had not been possible to circulate the usual Congress Handbook. The Annual Report and Balance Sheet had been approved by the Council.

Dr. Wooldridge seconded the motion.

The Secretary read the Auditors' certificate.

The motion for adoption of the Annual Report and Balance Sheet was *carried unanimously*.

Election of Two Vice-Presidents

On the motion of Mr. A. Thomson, seconded by Mr. A. Wright, the immediate Past-President was elected senior vice-President.

The President announced that it was the unanimous recommendation of Council that Mr. Sydney Jennings be elected Junior vice-President and President-Elect. Mr. Jennings was one of the small band of successful and established practising veterinary surgeons who had turned to the life of teaching and research. Those 13 years in practice must be of the greatest value to all the students who came his way.

Mr. Jennings's record of service to the Association and the profession was a formidable one. He had been a member of Council since 1940 and of the General Purposes and Finance Committee since the following year. He had been a most active member of the Survey Committee team and had visited a large number of practising veterinary surgeons in connexion with the Survey Scheme. He had been chairman of the Home Appointments Committee since 1953; that Committee entailed a great deal of clerical work and preparation of statements and evidence by the chairman, and Mr. Jennings had discharged those duties most punctually and to the satisfaction of all those concerned.

In the Divisions of the Association he had also a fine record, having been secretary of the Society of Practising Veterinary Surgeons, the Scottish Metropolitan Division and the Scottish Branch, and also President of the West of Scotland Division; and he had been a prolific author of addresses to divisional meetings on a wide variety of subjects.

Mr. Jennings had the remarkable attendance at Congress of having been to all except one since 1937, and his gift for entertaining them would be remembered on many informal occasions.

They were fortunate indeed that another busy man, well versed in the affairs of the Association, had agreed to take office, and he had much pleasure in proposing that Mr. Sydney Jennings be the President-Elect of the Association. (*Applause.*)

Professor A. Robertson, who seconded the proposal, said that Mr. Jennings had supported his nominaton as vice-President at Aberdeen, and the least he could do was to return the compliment, albeit not with the same eloquence. He was, unfortunately, no Brutus in that respect. But Brutus was also an honourable man, and from his experience of Mr. Jennings, as a student with him and as a colleague on the staff—although Mr. Jennings had fallen a little in estimation by transferring his allegiance to what was sometimes regarded as a rival organisation in the West—he felt that they had made an admirable choice of him as vice-President and President-Elect. He could think of no man more fitted to the post, and he knew that when the time came for Mr. Jennings to succeed Mr. Hignett, he would prove an admirable President.

The motion was *carried unanimously*, amid acclamation.

Mr. S. Jennings thanked the President and Professor Robertson for the kind things they had said about him. This Congress was Mr. Hebeler's Congress and also the Congress at which they welcomed their new President, and it would therefore be out of place for him to say much at this stage. Mr. Hignett had been so modest and said so little on being elected President earlier in the morning that he was himself wondering how much less he could now say. He would merely thank the members very much for the confidence with which they appeared to be willing to accept him for the future and say that he would do his utmost to serve the interests of the Association.

Election of Hon. Treasurer

The President, in proposing the re-election of Dr. E. Cotchin as Hon. Treasurer, said that Dr. Cotchin had been a tower of strength to him and to all the Officers and to the Association during the past year. They had had a number of financial problems, and they were going to have more. Dr. Cotchin had only been in the saddle long enough to find out what they were, and it was with very great confidence in him that he moved this motion.

Mr. J. McC. Ingram (senior vice-President) seconded the motion, which was *carried unanimously*.

Election of Hon. Secretary

The President said that the Association, in its wisdom, had passed a resolution that the Hon. Secretary could only be elected for 3 years continuously. Mr. D. Oliver had nearly come to the end of his term of 3 years. Mr. Oliver had also been a tower of strength to the Officers and, in addition, he had taken on the duties of chairman of the Small Animals Committee, no light task, which they hoped he would not be relieved of during the coming year.

It was the unanimous recommendation of Council, and he formally proposed, that Mr. T. C. Denholm of Nottingham be elected Hon. Secretary. Mr. Denholm had been a member of Council for some 4 or 5 years, during which time he had shown great interest in the affairs of the Association. He had also been President of the South-East Midlands Division of the Association, an extremely active Division situated in the hub of England.

Dr. Wooldridge seconded the motion which was *carried unanimously*.

Mr. Denholm said he was deeply conscious of the honour that was done to him in electing him to the office of Hon. Secretary, and he would strive to be worthy of that confidence.

Election of General Secretary

The President said that he was very happy to propose, on the unanimous recommendation of Council, that Mr. Knight be once again elected as General Secretary of the Association for the ensuing year.

Mr. A. M. Graham seconded the motion, which was *carried unanimously*.

The General Secretary expressed his thanks to members for re-electing him once more to this important office. He wished to take the opportunity of acknowledging publicly the very great help that he had received from members of the staff and from Miss Jones in particular.

On the motion of the President, seconded by Dr. E. Cotchin, Messrs. Fairbairn, Wingfield and Wykes were re-elected as Auditors of the Association.

As there was no other business, the President *adjourned the meeting to Saturday, September 5th.*

Adjourned Annual General Meeting

The adjourned Annual General Meeting was held in the Hotel Metropole, Folkestone, at 10 a.m., on Saturday, September 5th, 1959. The retiring President, Mr. H. F. Hebeler, was in the Chair.

The General Secretary (Mr. F. Knight) said that there was nothing to report as to matters arising.

Resolution

The General Secretary reported that a resolution had been passed by the meeting held on September 2nd to discuss Dr. J. G. Hall's paper on "Blood grouping in domestic animals," with Dr. K. C. Sellers in the chair. The resolution had been proposed by Dr. Montgomerie and seconded by Dr. Holman, and was in the following terms:—

> "That this Sectional Meeting of the B.V.A. Congress, conscious of the material research advances which have been made in the study of blood of animals in relation to blood typing and other methods, is satisfied that the time is ripe for a considerable extension of this research and the provision of a service in this subject. It recommends that the Technical Development Committee be asked to take the matter up as an urgent question with a view to supporting the full establishment of research and service in this field."

The resolution was *carried unanimously.*

Votes of Thanks

Mr. S. L. Hignett moved a vote of thanks to the Mayor and Corporation of the Borough of Folkestone for arranging for the various meetings of the Congress to be held, for the civic welcome at the opening session and the civic reception and dance. He knew that all of them would agree they could not have had such a successful Congress without the help given so unstintingly by the Mayor and the Corporation.

The vote of thanks was carried with acclamation.

Mr. S. Jennings proposed a vote of thanks to the authors of papers and those connected therewith. The main purpose of the Congress was the sharing of scientific knowledge, and therefore those people who presented papers were the people who really constituted the Congress. With the authors he coupled the chairmen of the sessions, some of whom had travelled long distances to do their duty in this respect, the openers of the discussions, and the recording secretaries. He also included those who had brought or sent films and those who had helped in the presentation of those films.

The vote of thanks was accorded with acclamation.

Mr. J. McC. Ingram moved a vote of thanks to the numerous bodies, organisations, and firms who had done a great deal to make the Congress so enjoyable. He mentioned the directors of Pfizer Limited, for providing the souvenir booklet and allowing parties to visit their works; the Principal of Wye College, and the Fatstock Marketing Corporation, who had arranged for visits, and Messrs. Martin-Walter Limited for their hospitality. He mentioned also the organisers of the dress show and the innovation of a wine-tasting party. Finally, he included the Folkestone Golf Club.

The vote of thanks was accorded with acclamation.

The President proposed a vote of thanks to the South-Eastern and Sussex Divisions for their hospitality last Sunday evening and for providing the additional members of the Provisional Committee which arranged the Congress. It might, he said, seem an anomaly that a member of the Provisional Committee should propose this vote of thanks, but his excuse was that, from the position of President, one saw rather more of the hard work of the Provisional Committee than did anybody else. He had already indicated to the meeting the great services that these two Divisions had done for the Association during the past 10 years, and he wished also to draw attention to the fact that during the course of the arrangements for the Congress there had been a change in the local secretaryship. He was certain that Mr. Sambrook would agree that much of the preliminary work, particularly in regard to the scientific papers, had been in the hands of Mr. John Scarnell, who was now in Australia. He felt that Mr. Scarnell should be included particularly in the vote of thanks which would be sent to all members of the Provisional Committee.

The vote of thanks was accorded by acclamation.

As a small token of appreciation of the hard work which they had done, the President then presented a clock to Mr. Sambrook and an X-ray viewing screen to Mr. Wright.

Messages from Overseas Delegates

Professor Seekles (Netherlands) said that he regretted that, owing to a misunderstanding, the Faculty of Veterinary Science of the University of Utrecht and the Netherlands Veterinary Association, which he was honoured to represent, had not given him a special message to deliver to the Congress. He was not dictatorial enough to read a message from himself which might lead them to believe that he was speaking in the name of colleagues in the Netherlands. A message to such an important body as the B.V.A. was not a matter of detail. He would therefore confine himself to the expression of thanks.

The Netherlands veterinary profession as a whole considered it a great privilege to be invited every year to the annual Congress of the B.V.A., for two reasons. Firstly, in the Netherlands they were certain that the papers to be presented would be of high standard, so that attending the Congress was a constant source of great satisfaction. Secondly, there were numerous social functions that gave ample scope for making friends with colleagues in this country. The 77th Congress of the B.V.A. had entirely met the great hopes he had held in this respect.

He offered sincere thanks to the President and Officers of the Association, and to the members and their ladies, for all that they had done to make the stay of himself and Mrs. Seekles in Folkestone so pleasant.

He wished also to take the opportunity of congratulating the Association on its decision to elect Mr. S. L. Hignett as President for the coming year. He spoke now not as a foreigner, but as a very good friend of the B.V.A. and of the British veterinary profession who had himself enjoyed a sort of British veterinary qualification for some time past. To Mr. Hignett, who was so well known in the Netherlands for his outstanding work in veterinary research, he offered all good wishes and good luck during his year of Presidency.

Professor Winquist (Sweden) conveyed the greetings of the Swedish Veterinary Association. He would take back to his country not only copies of all the papers read and discussed, but also the memory of a most rewarding time. For a long time the veterinary profession in Sweden had appreciated the very high standard of British veterinary science and practice, and the papers presented and discussed at the Congress had certainly confirmed that impression most definitely. He congratulated the Association on a most successful meeting, and expressed the sincere gratitude of himself and his wife for the hospitality and kindness which they had enjoyed.

Dr. Julius Frank (Canada) said that the President of the Canadian Veterinary Medical Association had asked him to convey the greetings of that Association, which was a very young organisation, to the B.V.A., whom they regarded as the mother organisation. He had also been asked by his chief, the Veterinary Director-General, to convey the greetings of the Health of Animals Division to the Congress. He wished also to express sincere personal thanks for the kindness which had been extended to him during

his stay. He did not think he had ever enjoyed a meeting so much. This was his first trip to Great Britain, and everybody had been very kind to him. He hoped that in the not-too-distant future he might have the privilege of returning some of that hospitality.

Mr. W. G. Beaton (Kenya), President of the Kenya Veterinary Association, said that as a Division of the B.V.A. they had the right to be at the Congress and they took the opportunity to exercise that right on every occasion when it was possible to send a delegate. In Kenya, where they were far away from those in Britain in many ways, they were very conscious of any British link, and they hung on to those links as much as possible. The B.V.A. as their parent body was the body which they emulated to the maximum of their ability. They must, of course, in a cosmopolitan country include in their membership many persons who would not otherwise be eligible for membership of the B.V.A., but in everything they did they took the B.V.A. as their guide.

It was his duty to convey a message given to him at their last meeting in which his colleagues had asked him to express their personal honour at being represented at the Congress and to say once again how much they were glad to be a section of this great Association. They were also pleased to know that the President for next year was Mr. Sam Hignett, who was very well known in Kenya and held in great esteem there.

He wished to express thanks for the very kind hospitality given to him personally.

The General Secretary read a telegram from the American Veterinary Medical Association, and letters from the representatives of the Acting High Commissioner for New Zealand and the German Veterinary Association.

Induction of President

The retiring President (Mr. H. F. Hebeler) said that, before inducting the new President, he wished to express thanks to two Officers who had served the Association well and at great cost in time to themselves.

Mr. John Ingram had completed a continuous period of 6 years as an Officer, first as Honorary Secretary, and then as President. It was not unknown for people to have held office for that period before, but he suggested that the present work of the Association put such heavy demands on people that this was a tremendous record of service.

Mr. Denis Oliver had to retire as Honorary Secretary under a rule of the Association. He had been a marvellous Honorary Secretary. Mr. Oliver had given him great help personally, and the office of Honorary Secretary was one that stood very high in the list.

He proposed a vote of thanks from the Association to Mr. Ingram and Mr. Oliver.

Mr. Claxton seconded the motion, which was *carried with acclamation.*

The President, continuing, said that before divesting himself of the duties of President, he wished to thank the Officers, the Council, and particularly the chairmen of the standing Committees, all of whom had helped to make his work during the year a great deal easier than it would otherwise have been. He thanked also his colleagues in practice. Those members present who were in private practice would know that one could not carry out any sort of official duty without the fullest co-operation from those who were carrying on the work at home. He thanked also his wife for her forbearance in the disruption of family life, and he thanked the very many friends of long standing and newly made during the past year for all the support they had given him.

In divesting himself of the gown and chain of office, it was a moment of passing sadness, but it was with great happiness, and great satisfaction, that he placed them upon the shoulders of Mr. S. L. Hignett.

Mr. Hebeler then invested Mr. Hignett with the Presidential Chain of Office, to the accompaniment of prolonged applause.

The President (Mr. Hignett), in response, said that when last Monday he had been elected as President, he had intimated that he would rather leave until the present occasion anything that he had to say. He wished now to thank Mr. Hebeler most sincerely for the very kind things he had said on Monday and again this morning. He thanked also Dr. Montgomerie for his exceedingly generous comments—and to Professor Seekles and Mr. Beaton he would also say how appreciative he was of what they had said about him. He wished also to place on record his indebtedness to his wife and family, to his colleagues—again including particularly Dr. Montgomerie—who had made it possible for him to accept this high office.

He regarded it as an honour conferred on the Sussex Veterinary Society. Although a member of several Divisions of the B.V.A., he singled out the Sussex because it was that Division which he had represented for so long on the Council, and it was that Division for which he had a special affection.

In paying a tribute to the retiring President, he knew that he could state quite categorically without any fear of dissent that Mr. Hebeler had been outstanding in the presidency. Not unexpectedly, Mr. Hebeler had had a complete grasp of all subjects connected with the Association's various projects and inquiries. Above all, his lucidity had been greatly appreciated by members of Committees and especially by members of Council. Even with his natural modesty, the President felt sure that Mr. Hebeler would long remember the spontaneous outburst of applause which had followed a particularly masterly pronouncement on a difficult and complex matter of policy at the last Council meeting held in Edinburgh last April.

He thanked Mr. Hebeler for his leadership during the past year. He thanked him for the fact that most of the tasks which had been undertaken since the last Congress had been completed, and where they had not been completed and where Mr. Hebeler had a special knowledge of the negotiations, he had willingly agreed to see them through to the end.

In paying this tribute, he wished to include Mrs. Hebeler, who for so long, largely behind the scenes, had done much work and had made great sacrifices for the Association, but had at the same time so charmingly graced the Association's functions when called upon to do so. (*Applause.*)

The William Hunting Awards

The President then presented the William Hunting Awards for 1958, details of which were published in THE VETERINARY RECORD of May 2nd, 1959. The winners were Mr. T. Hughes Ellis and Mr. C. M. Gould.

News and Comment

CONGRESS GOLF COMPETITIONS

There were 22 competitors for the "Simpson" Golf Trophy, played over the course of the Folkestone Golf Club on September 3rd. The winner was Mr. A. Shaw, M.R.C.V.S., of Beverley, Yorkshire.

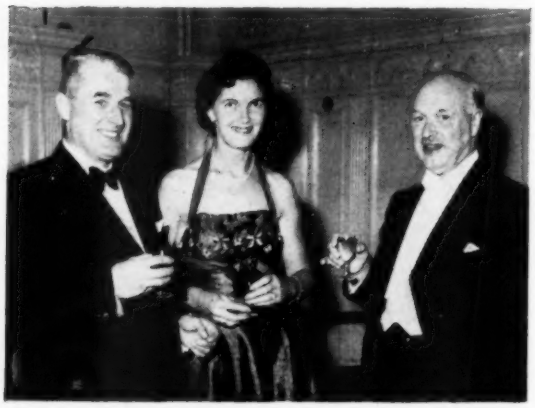
Owing to a lack of sufficient entries the ladies' competition for the "Dunkin" trophy was not held this year.

CONGRESS DELEGATES VISIT PFIZER LTD.

Nearly 150 of the many delegates who were present at the Folkestone Congress visited the Sandwich plant of Pfizer Ltd., the Kent manufacturing chemists who manufacture pharmaceutical products for medical and veterinary use.

They saw the manufacturing process of the antibiotic Terramycin, and other drugs used widely in veterinary practice. Pfizers have recently completed a veterinary and nutritional research unit at their Sandwich plant.

Mrs. Thomson, of Glasgow, wife of a former President, is discussing the ups and downs of presidential responsibility with Mrs. Jennings, another Glaswegian, whose turn will come in 1961.



The new Professional Secretary, Mr. John Anderson, and his wife with the present General Secretary, Mr. F. Knight.

OFFICIAL DELEGATES AND VISITORS TO THE B.V.A. CONGRESS

Overseas Associations

Australian Veterinary Association, Mr. F. V. Collins, B.V.SC. (Also representing the High Commissioner for Australia);

Canadian Veterinary Medical Association and Health of Animals Division, Department of Agriculture, Dr. Julius Frank;

Ceylon Veterinary Association, Dr. A. Bandaranayaka;

Dutch Veterinary Association, Professor Dr. L. Seekles;

German Veterinary Association, Dr. K. Ohly and Dr. Kurt Wagener;

Kenya Veterinary Association, Mr. W. G. Beaton, C.B.E., M.R.C.V.S., D.V.S.M.;

New Zealand Veterinary Association, Mr. C. V. Dayus, M.R.C.V.S. (Agricultural Adviser to High Commissioner, and also representing the High Commissioner for New Zealand);

Swedish Veterinary Association, Associate Professor Gösta Winqvist;

Government Departments

Colonial Office, Department of Agriculture, and Department of Health for Scotland, Mr. R. M. Arnold, B.SC., M.R.C.V.S., and Mr. D. S. Barbour, M.R.C.V.S.;

Department of Agriculture, Dublin, Mr. P. Harnett, M.R.C.V.S., Mr. J. F. Timoney, M.R.C.V.S., and Professor P. E. Mullaney, M.R.C.V.S.;

Isle of Man Board of Agriculture, Mr. D. W. Kerruish, M.R.C.V.S.;

Ministry of Agriculture, Fisheries and Food, Animal Health Division, Mr. J. N. Ritchie, C.B., B.SC., F.R.C.V.S., D.V.S.M., F.R.S.E., and Mr. A. M. Graham, M.R.C.V.S.;

Ministry of Agriculture, Northern Ireland, Mr. J. E. Rosborough, M.R.C.V.S., Mr. S. A. Barclay, M.R.C.V.S., and Dr. D. Luke, B.SC., M.R.C.V.S.;

Ministry of Health, Dr. J. M. Ross.

Local Authorities

Birmingham, Councillor H. Small and Mr. C. G. Allen, M.R.C.V.S., D.V.S.M.;

Cardiff, Councillor W. Groves and J. H. M. Hughes, M.R.C.V.S., D.V.S.M.;

Dundee, Mr. A. Spreull, M.R.C.V.S.;

Glasgow, Mr. William H. Russell and Mr. S. G. Abbott, M.B.E., M.R.C.V.S., D.V.S.M.;

Manchester, Councillor T. Lomas, J.P., Councillor Miss L. Thomas, J.P., and Mr. D. E. Orr, M.R.C.V.S.;

Portsmouth, Mr. R. Scoular, M.R.C.V.S.;

Preston, Mr. F. J. Proctor, B.SC., M.R.C.V S., D.V.S.M.

Royal Army Veterinary Corps

R.A.V.C., Brigadier J. Clabby, O.B.E., M.R.C.V.S., and Major H. Bishop, M.R.C.V.S

Universities with Veterinary Schools

Edinburgh, Professor A. Robertson, M.A., PH.D., M.R.C.V.S., F.R.I.C., F.R.S.E.;
Liverpool, Dr. G. O. Davies, M.R.C.V.S., D.V.H.;
London, Dr. R. E. Glover, M.A., F.R.C.V.S.

Other Organisations

Agricultural Institute, Dublin, Mr. N. E. Downey, M.R.C.V.S.;
Agricultural Research Council, Dr. R. Scarisbrick, M.R.C.V.S.;
Milk Marketing Board, Mr. G. F. Smith, M.R.C.V.S.;
The Royal Society of Health, Professor Harold Burrow, M.R.C.V.S., D.V.S.M., F.R.S.H.

Students' Unions

Association of Veterinary Students, Mr. P. Eyre;
University of Liverpool, Mr. R. S. Jones;
University of London, Mr. J. Luckhurst;
University of Glasgow V.M.A., Mr. T. B. Begg.

Member from Overseas

Mr. G. S. Peppin, D.V.M., M.R.C.V.S., of Lethbridge, Alberta, Canada.

Visitor from Overseas

Mr. R. F. Patil (India).

APPOINTMENTS IN THE NATIONAL AGRICULTURAL ADVISORY SERVICE

Mr. O. G. Williams, B.SC. (AGRIC.), formerly Assistant Agricultural and Food Attaché, Washington, has been appointed Deputy Director at the Bangor Sub-Centre in succession to Mr. H. E. Evans, B.SC. (AGRIC.), whose appointment as Director of the N.A.A.S. for Wales was announced earlier this year.

Mr. A. J. Davies, B.SC. (AGRIC.), Regional Grassland Officer for the East Midland Region, has been appointed Deputy Director at the Cardiff Sub-Centre in succession to Mr. J. Howard Morgan who is resigning on September 15th, 1959.

THE COMMERCIAL EXHIBITION AT CONGRESS

Smith, Kline & French Ltd.

Smith, Kline & French Laboratories Ltd., Welwyn Garden City, manufacturers and distributors of nitrofuran products in the U.K., featured two of these products: Bifuran and Neftin.

The main emphasis of the display was on Bifuran—a product incorporating nitrofurazone and furazolidone, two of the most successful nitrofuran compounds. Bifuran is of particular interest to the veterinary profession in its application to the prophylaxis and therapy of enteritis and scouring conditions in pigs. It is also used for the control of caecal and intestinal coccidiosis in poultry. There are two forms of Bifuran available: Bifuran Supplement for mixing in feeds, and Bifuran Soluble Tablets for dissolving in drinking water. The tablets are also useful for oral dosage of pigs off their feed.

Neftin furazolidone is a nitrofuran with a wide antibacterial spectrum and a high degree of effectiveness against several disease-causing protozoa. It is widely used by the poultry industry as a feed additive as it is particularly effective in the control of Salmonella infections such as Fowl Typhoid and as an adjunct to blood-testing in the eradication of Pullorum Disease. Other indications for Neftin include Blackhead, Hexamitiasis, and Infectious Synovitis.

Willows Francis Ltd.

The centre feature of the stand was allocated to the Willows veterinary product Neovagon, a uterine pessary, non-toxic and non-irritating, for uterine hygiene and retained placenta. The new individual heat-sealed packs were displayed.

Two complementary panels detailed a number of Willows well-established veterinary specialities for use in large- and small-animal practice, *e.g.*:—

Vioxel, the ear and eye ointment containing Neomycin and nitrofurazone, Neo-Sulphentrin, combining mixed sulphonamides and detoxicants with neomycin and streptomycin in tablet form, for the effective treatment and control of infectious enteritis in all species; Xylotox veterinary, the renowned self-sterilising local anaesthetic.

A special illuminated panel detailed the sole distributorship of veterinary products of Geigy Pharmaceutical Co., featuring Butaxolidin, Eurax, and Steroxin.

Considerable interest was aroused by the announcement of the recent appointment of Willows as sole distributors of the biologicals manufactured and prepared by the internationally famous research organisation—the Connaught Medical Research Laboratories—University of Toronto, Canada. The illuminated panel allocated for this introduction indicated canine vaccines and, for the first time in this country, mink vaccines prepared exclusively for use in mink. The range included:—

Disvax—canine distemper and hard pad vaccine; Dovax—the first combined live vaccine, in one single injection—canine distemper and hepatitis; Heprovax—infectious canine hepatitis vaccine; Muvax—mink distemper vaccine—chick embryo origin specially prepared for the inoculation of mink; and Estervax—mink enteritis vaccine—inactive virus of mink tissue origin.

Members of the profession were able to view a full range of veterinary instruments, including the Atlas nylon Syringe and the new Oster electric dog clipper.

Baillière, Tindall & Cox

Baillière, Tindall & Cox, veterinary publishers and booksellers showed a wide range of books including all the many standard text-books which they publish. An interesting item on their stand was an advance copy of "Veterinary Applied Pharmacology and Therapeutics" by P. W. Daykin, B.SC., M.R.C.V.S. This book, which was formerly "Hoare's Veterinary Materia Medica and Therapeutics," has been completely rewritten and will be published early 1960.

Other books on display included "Newsom's Sheep Diseases," second edition, by Hadleigh Marsh, D.V.M. This most complete and authoritative book on the subject of sheep diseases, edited by one of the foremost authorities on the subject, discusses the symptoms, diagnosis, treatment, and prevention of over 150 sheep diseases or diseases which require special consideration when found in sheep.

"Veterinary Anaesthesia," fourth edition, by J. G. Wright, D.SC., M.V.SC., F.R.C.V.S. This is a a complete guide to anaesthetic agents, general and local, and covers the latest advances in this field.

"Veterinary Ophthalmology" by R. H. Smythe, M.R.C.V.S., second edition. This is the only book on the subject in the English language. The first part covers the anatomy and physiology of the domestic animals and of a large number of other species. The remainder is devoted to the clinical and surgical aspects of animal ophthalmology.

"The Evolution of the Veterinary Art" by J. F. Smithcors, D.V.M., PH.D. This is a most original and fascinating book which records the history of the practice of veterinary medicine from the time of the ancient civilisation until 1850. The illustrations have been selected from a collection of rare veterinary works.

"Veterinary Toxicology" (formerly Lander's "Veterinary Toxicology") by R. J. Garner, M.A., M.V.SC., F.R.C.V.S., A.R.I.C.

"Infectious Diseases of Domestic Animals," third edition, by W. A. Hagan, D.V.M., D.SC., and D. W. Bruner, D.V.M., PH.D.

"A Textbook of Meat Inspection," third edition, by H. Thornton, B.V.SC., M.R.C.V.S., D.V.H., F.R.S.H.

"Mönnig's Veterinary Helminthology and Entomology," fourth edition, revised by G. Lapage, M.A., M.D., M.SC.

The President's Reception

The President and Mrs. Hebeler held their Reception on the evening of the last full day of Congress, Sept. 4th. They are seen awaiting their guests, who numbered upwards of 500. The Reception was held in the Metropole Hotel, Folkestone.

Bottom left.—Professor E. C. Amoroso, who had been elected an honorary member of the B.V.A. during Congress week, is received.

Bottom right.—The Officers of the Association and their wives. Left to right, Mr. and Mrs. Oliver, Mr. and Mrs. Ingram, the President and Mrs. Hebeler, Mr. and Mrs. Hignett, and Dr. and Mrs. Cotchin.

In his Address to the Association the President referred to those who "sink into Limbo" at the end of their term of office. It seemed humane to enquire into the well-being of some of these wraiths in order that our readers might feel reassured about them. Here are, if the term may be employed, a pride of past Presidents: (right to left) Mr. Graham, Mr. Bruford, Mr. Wilkinson, Dr. Montgomerie, Dr. Wooldridge, Mr. Wright, Professor Robertson, Mr. Ingram, and Mr. Thomson.

. . . or clever ?

Is it better to be beautiful . . .

The answer is that we love our wives for their brains and our scientists for their kind hearts.

Edinburgh

The undermentioned candidates have passed the *Final Professional Examination (Part I)* in the subject *of Veterinary Hygiene* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Allsup, Thomas N.; Calvert, David J.; Dawson, Peter S.; Downie, James G.; Doxey, David L.; Eyre, Peter; Fairlie, George; Footman, Brian; Gill, Kenneth A. K.; Harcourt, Ralph A.; Irwin, Verney C. R.; Jackson, Peter G. G.; McIlveen, Samuel W. D.; Mair, Malcolm L.; Middleton, Nigel T.; Moore, Alexander; Radley, David E.; Rollo, David G.; Taylor, Stuart M.; Tindall, John R.; Wilkinson, Ian S.

The undermentioned candidates have passed the *Third Professional Examination (Part I)* in *Veterinary Pharmacology* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Anderson, Euan C.; Arbuckle, James B. R.; Bailey, Sheila A.; Broome, Brenda M.; Campbell, Edward G.; Carwardine, Paul C.; Cooper, Michael J.; Coulthwaite, John R.; Davies, Charles S.; Foggie, Janet; Forbes, Derek; Fraser, Thomas W.; Gardner, David W.; Glickman, Murray A.; Goodman, Alan P.; Hoskin, Brian D.; Kirk, James O.; Kirkham, John; Lander, Keith P.; McNab, Ian; Marsh, Ian A.; Mighell, John S.; Moar, John A. E.; Muirhead, Michael R.; Oduro, Gottfried A.; Paterson, Robin J.; Pearson, Clifford; Pearson, Michael V. M.; Reece, Peter; Robertson, John F.; Rodger, John O. K.; Sansi, Kamoru A. O.; Schermbrucker, Christopher G.; Searles, Patricia A.; Stewart, Colin G.; Sutherland, Stewart D.; Young, Godfrey F.

The undermentioned candidates have passed the *Third Professional Examination (Part II)* in the subjects of *Veterinary Pathology, Bacteriology,* and *Parasitology* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Birch, Allen Vaughan; Harrison, Richard D.; Jones, Meredydd; Macmillan, Elizabeth G. M.; Pratt, John H.; Seckington, Ian M.; Walton, John R.; Williams, David A.; Wood, Hamish.

The undermentioned candidates have passed in the subject of *Veterinary Pathology* of the *Third Professional Examination (Part II)* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Abbott, John E. D.; Reeves, Ronald J. C.; Schermbrucker, Christopher G.; Searles, Patricia A.; Somerville, John R.

The undermentioned candidates have passed in the subject of *Veterinary Bacteriology* of the *Third Professional Examination (Part II)* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Bulley, Frank R. T.; Duncan, Walter D.; Gardner, Edward A.; Jobling, Terence.

The undermentioned candidates have passed in the subject of *Veterinary Parasitology* of the *Third Professional Examination (Part II)* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Bulley, Frank R. T.; Duncan, Walter D.; Jobling, Terence.

The undermentioned candidates have passed in the subject of *Veterinary Preventive and State Medicine of the Final Professional Examination (Part II)* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Atkinson, William I.; Henry, Robert R.; McGregor, Donald S.; Strathern, Moira St. C. W.; Turnbull, Robert W.; Ure, William S.; Wahler, Saw.

The undermentioned candidates have passed in the subject of *Veterinary Obstetrics* of the *Final Professional Examination (Part II)* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Lake, David E.; Logan, Ernest F.; McGregor, Donald S.; MacLeod, Brenda R.; Strathern, Moira St. C. W.; Wahler, Saw; Watson, Ewen E. B.

The undermentioned candidates have passed in the subject of *Veterinary Anatomy and Histology* of the *Second Professional Examination* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Hislop, Christopher R. B.; Robertson, Harvey Y.

The undermentioned candidates have passed in the subject of *Veterinary Physiology* (including *Biochemistry*) of the *Second Professional Examination* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Davies, Lewis D.; Forgrave, Bryan T. G.; Hargreaves, Charles E.; MacIntyre, Gerald C.; Meldrum, Keith C.; Ross, Ian C.

The undermentioned candidates have passed in the subject of *Chemistry* of the *First Professional Examination* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Adams, Neil C.; Alexander, Richard J.; Breton, Derek A. G.; Brown, Paul; Buadu, Michael K.; Burney, John; Cameron, Hugh; Carnegie, David B.; Carstairs, William; Cowburn, Anthony C.; Cran, Hugh R.; Dale, Stephen J.; Dobson, David J.; Dobson, Keith B.; Dobson, Michael C.; Eden, Donald T.; Fielding, Michael J.; Gibbons, Robert W.; Gill, Anthony H.; Green, James C.; Harding, Clifford; Henson, Peter M.; Horne, Ann M.; Le Page, Richard W. F.; Little, Thomas W. A.; Macdonald, William I.; Martin, Stephen J.; Naish, Nicholas G.; Stewart, Anthony C.; Sutherland, Colin D.; Thoresen, Aase; Trethewey, John C.; Veitch, Liana M.; Wilson, Alan J.; Windsor, Roger S.; Wray, Clifford; Yeaman, John; Yelland, Patricia A.

The undermentioned candidates have passed in the subject of *Biology* of the *First Professional Examination* for the degree of *Bachelor of Veterinary Medicine and Surgery* (B.V.M. & S.):—

Adams, Neil C.; Allan, Eleanor J.; Baker, Dale; Bell, Andrew S. W.; Breton, Derek A. G.; Brown, Paul; Buadu, Michael K.; Burney, John; Cameron, Hugh; Carstairs, William; Clark, John C.; Cowburn, Anthony C.; Cran, Hugh R.; Dale, Stephen J.; David, John E.; Dobson, Keith B.; Douglas, Rodger G. A.; Doyle, Robert; Farrell, Janice M. F.; Gill, Anthony H.; Green, James C.; Horne, Ann M.; Le Page, Richard W. F.; Martin, Stephen J.; Naish, Nicholas G.; Peele, John C. S.; Stewart, Anthony C.; Sutherland, Colin D.; Trethewey, John C.; Veitch,

Liana M.; Windsor, Roger S.; Yelland, Patricia A.

The undernoted candidates have passed the *Part II Examination* for the *Diploma in Tropical Veterinary Medicine* (D.T.V.M. Univ Edin.):—

Browne, Vernon Anthony Dennison, B.SC., M.R.C.V.S.; Chong, Sip Ngow, B.SC., M.R.C.V.S.; Halpin, Francis Brendan, M.R.C.V.S.; Lal, Munshi, G.B.V.C. (PATNA), B.V.SC. & A.H. (AGRA); Menard, Fernand John Robert Reynolds, M.R.C.V.S.; Noble, Neil Maclean, M.R.C.V.S.; Paine, Gordon David, M.R.C.V.S.; Parker, Francis Johnson, M.R.C.V.S.; Peritz, Franz Joseph, M.R.C.V.S.

A 21st BIRTHDAY REUNION

Members of the profession who qualified in London in 1938 are to hold a 21st birthday reunion at the Farmers' Club, Whitehall Court, London, S.W.1, on October 9th at 6 p.m. The organisers have tried to contact everyone who is eligible to take part in the reunion, but if any 1938 graduate has not received an invitation he or she is cordially invited to be present. Already a number of acceptances have been received, and letters will be read from those unable to be present. We are advised that among other notable achievements of 1938 graduates is the fact that the only two women Fellows of the Royal College are among their number.

PERSONAL

Mr. J. B. Lawson has joined the Ministry's veterinary field staff, and has taken up station at Newcastle upon Tyne.

Birth

FORSTER.—On August 31st, 1959, to Audrey, wife of Peter E. Forster, B.V.SC., M.R.C.V.S., of Warrington, Lancashire, a daughter.

PAVORD.—On August 23rd, 1959, to Janet (*née* Hoare), wife of Anthony Pavord, B.V.SC., M.R.C.V.S., of The Close, Thornbury, Gloucestershire, a daughter, Briony Elizabeth.

WILLIAMSON.—On September 7th, 1959, to Josephine, wife of Philip T. Williamson, B.SC., M.R.C.V.S., of "Cleveland," Gladstone Street, Gainsborough, Lincs., a daughter, Amanda, a sister for Fiona.

Marriage

KELING—MAJEED.—On August 15th, 1959, Mohamed Noordin, M.R.C.V.S., State Veterinary Officer, Kelantan, Malaya, eldest son of Inche and Mrs. Keling bin Shukor of Kuala Pilah, to Anne Salmiah, younger daughter of Mr. and Mrs. C. L. A. Majeed of 16a, Pahang Road, Kuala Lumpur, Malaya.

COMING EVENTS

September

23rd (Wed.). General Meeting of the Lancashire Veterinary Association, Patton Arms, Warrington, 7.45 p.m.

24th (Thurs.). Meeting of the Supplementary Veterinary Register Division at 7, Mansfield Street, W.1, at 3 p.m. Committee meeting at 2 p.m.

Meeting of the Lakeland Veterinary Association at the Tufton Arms, Appleby, 6 p.m.

25th (Fri.). Meeting of the North Wales Division at the Department of Agricultural Chemistry, Bangor, 2 p.m.

Meeting of the Shropshire Veterinary Club at the Oak Hotel, Shelton, Shrewsbury, 8 p.m.

29th (Tues.). Meeting of the B.S.A.V.A. Midland Region at the George Hotel, Bird Street, Lichfield, 7.30 p.m.

30th (Wed.). Meeting of the Southern Counties Veterinary Society at the Royal Hotel, Winchester, 7.30 p.m.

30th September, 1st and 2nd October (Wed., Thurs. and Fri.). Quarterly Meeting of Council, R.C.V.S.

October

1st (Thurs.). Banquet of the Welsh Branch at the City Hall, Cardiff.

Share-Jones Memorial Lecture on "The Skin of the Dog," by Mr. H. V. Hughes at the Royal Veterinary College, Camden Town, N.W.1, 5 p.m.

Autumn Meeting of the North of Scotland Division in the Drunossie Hotel, Inverness, 2.30 p.m.

7th (Wed.). Autumn Meeting of the Society of Women Veterinary Surgeons at the Guide Dogs for the Blind Association Training Centre, Warwick New Road, Leamington Spa, 2.30 p.m.

9th (Wed.). Meeting of the Lincolnshire and District Division at the Berkeley Hotel, Doncaster Road, Scunthorpe, 2.15 p.m.

13th (Tues.). Annual Dinner-Dance of the Mid-West Veterinary Association at the Berkeley Café, Clifton, 7.15 p.m.

16th (Fri.). Meeting of the Ayrshire Veterinary Association in the Hannah Dairy Research Institute, 2.30 p.m.

22nd (Thurs.). General Meeting of the South Eastern Veterinary Association at the Royal Star Hotel, Maidstone, 2.30 p.m.

24th (Sat.). Meeting of the B.S.A.V.A. North West Region at the Swan Hotel, Chester, 7.30 p.m.

27th (Tues.). Meeting of the Society for the Study of Animal Breeding at the Royal Society of Medicine, 1, Wimpole Street, London, W.1, 11.30 a.m.

November

4th, 5th and 6th (Wed., Thurs. and Fri.). B.V.A. Committee and Council Meetings in London.

B.V.A. COMMITTEE AND COUNCIL MEETINGS IN LONDON

Tuesday, November 3rd—at 7, Mansfield Street

5.00 p.m. Finance Sub-Committee.

Wednesday, November 4th—at 7, Mansfield Street

10.00 a.m. Parliamentary and Public Relations Committee.

11.30 a.m. Farm Livestock Committee.

2.15 p.m. Small Animals Committee.

Thursday, November 5th—at 7, Mansfield Street

10.00 a.m. Veterinary State Medicine Committee.

11.30 a.m. Home Appointments Committee.

2.30 p.m. General Purposes and Finance Committee.

Friday, November 6th—at Connaught Rooms, Great Queen Street, London, W.C.2

10.15 a.m. Council Meeting.

Letters to the Editor

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

SCIENTIFIC

Attempt to Transmit Scrapie by Injection of Semen from an Affected Ram

Summary.—Semen from a ram affected with scrapie was injected subcutaneously into 20 day-old lambs; 14 uninoculated lambs were used as controls. Throughout a period of 2½ years no animal showed clinical signs of scrapie. Histological examination of the medullas from sheep killed during the course of the experiment revealed no significant vacuolation.

An experiment was designed to test the possibility of transmitting scrapie by injection of semen from an affected ram. The experiments were conducted on day-old lambs, as the "incubation period" in lambs appears to be less than in adults (Stamp, 1958). Lambs were inoculated with semen from an affected ram in March, 1957, and to date none has exhibited clinical signs of scrapie or has developed significant vacuolation of neurones in the medulla.

Materials and Methods.—Animals were divided into control and experimental groups. Control animals which received no inoculation consisted of 5 Dorset Horn wether lambs, 5 Dorset Horn ewe lambs, 1 Suffolk wether lamb and 3 Suffolk ewe lambs. Experimental animals consisted of 6 Dorset Horn wether lambs, 11 Dorset Horn ewe lambs, 2 Suffolk wether lambs and 1 Suffolk ewe lamb.

The semen was collected from a 3-year-old Suffolk ram that showed clinical signs of scrapie over a period of 6 months. These signs were incessant rubbing and loss of fleece, a positive nibbling response, tremor and positional nystagmus. The semen was kindly collected on 3 occasions by Mr. L. E. A. Rowson by electrical stimulation of the ampullae. Semen was stored in aliquots of 1 ml. at −16° C. and was diluted 1 : 5 with sterile distilled water just prior to inoculation. 1 ml. of the diluted semen suspension was injected subcutaneously in the neck of experimental lambs within 24 hours of birth.

Experimental and control animals were destroyed at varying intervals from the date of inoculation and 10 sections of each medulla were examined histologically (Palmer, 1957). 268 vacuolated neurones were found in 10 sections from the medulla of the affected ram from which the semen was taken.

Results.—Throughout the period of the experiment (2½ years) none of the experimental or control animals showed clinical signs of scrapie. Experimental and control sheep were killed at varying intervals in the course of the experiment, but no significant vacuolation was found (Table I). In September 1959, 10 experimental and 5 control ewes were still alive and apparently healthy (Table II).

TABLE II

BREED AND SEX OF EXPERIMENTAL AND CONTROL SHEEP, SHOWING NO CLINICAL SIGNS OF SCRAPIE, SURVIVING 30 MONTHS AFTER THE DATE OF INOCULATION

Period after inoculation in months	Experimental	Control
	Number of ewes	Number of ewes
30	9 Dorset Horn 1 Suffolk	4 Dorset Horn 1 Suffolk

Acknowledgments.—This work was carried out during the tenure of a Fellowship from the Leverhulme Trust. I wish to thank Professor L. P. Pugh for facilities and encouragement and Mr. I. K. Gauld for technical assistance. The animals were purchased by a grant from Imperial Chemical Industries.

Yours faithfully,
A. C. PALMER

Department of Veterinary Clinical Studies,
School of Veterinary Medicine,
Madingley Road,
Cambridge.

September 2nd, 1959.

References

PALMER, A. C. (1957). *Vet. Rec.* **69.** 1,318.
STAMP, J. T. (1958). *Ibid.* **70.** 50.

The Collection of Boar Semen

Sir,—On a recent visit to this country Dr. Tazaemon Niwa demonstrated the method of collection described by Ito, Niwa and Kudo (1948) which is in general use in Japan. Since then this method has been adopted for routine use at the insemination centres at Cambridge and at Lyndhurst and was shown to us there by Mr. V. J. A. Manton, M.R.C.V.S., and Mr. D. H. L. Madden, M.R.C.V.S.

The object of this letter is to describe a method

TABLE I

SHOWS (*a*) THE BREED AND SEX OF EXPERIMENTAL AND CONTROL SHEEP KILLED AT INTERVALS AFTER THE DATE OF INOCULATION AND (*b*) THE RANGE OF TOTALS OF VACUOLATED NEURONES COUNTED IN 10 SECTIONS OF MEDULLA FROM EACH ANIMAL

Period after inoculation in months	Experimental		Control		Range of totals of vacuolated neurones in 10 sections of medulla
	Number of ewes	Number of wethers	Number of ewes	Number of wethers	
Up to 7	2 Dorset Horn	1 Suffolk	1 Dorset Horn	1 Dorset Horn	0– 6
11–14	—	1 Dorset Horn	1 Suffolk	1 Suffolk	0– 4
19	—	5 Dorset Horn 1 Suffolk	—	4 Dorset Horn	0–10
26	—	—	1 Suffolk	—	0

for the collection of boar semen which is based on the Japanese method but which employs no special equipment and which we believe is admirably suited to use in the field. We hope this information will be useful, not only to those specially interested in problems of artificial insemination of pigs but also to clinicians who may be called upon to collect semen for the evaluation of boar fertility.

With the operator standing on the boar's right side, the boar is allowed to mount. The right hand is presented partially closed so that the penis enters an " artificial vagina " the opening of which is formed by the encircling thumb and index finger. The fingers and thumb are gradually closed further to grip the penis and when erection is judged to be complete, the penis is held in a firm grip in such a position that the last finger is about 1 cm. from the tip of the glans penis. It is important that no attempt should be made to grip the penis tightly until there is complete erection and the grip should not be relaxed once ejaculation has begun until collection is completed. The penis is directed away from the sow and the ejaculate is collected into a convenient vessel *via* a funnel containing a loose pad of glass wool to remove the gelatinous fraction. When normal ejaculation occurs there is at first an intermittent forceful emission of opaque fluid semen with a high sperm content and of pellets of gelatinous secretion; the succeeding clear " post sperm " fraction is ejaculated more continuously and less violently.

For obvious personal reasons and because of the danger of transmitting infection from boar to boar, we now wear rubber gloves for collection and we have found rough-faced *post-mortem* gloves to be excellent for the purpose. We have used the technique described above to collect 20 ejaculates from 5 boars. The method has the advantage that the semen can be collected free from the contamination which sometimes occurs as the result of fouling of the entrance to the conventional artificial vagina and the different fractions of an ejaculate can be separated with much more certainty than with a conventional artificial vagina. Samples collected in this way show excellent characteristics; sperm fractions show very clearly the " wave motion " which is a common feature of active ram and bull semen but which we have previously found to be inconspicuous in boar semen.

Yours faithfully,

J. L. HANCOCK and G. J. R. HOVELL.
A.R.C. Animal Breeding Research Organisation,
Edinburgh, 9.

September 2nd, 1959.

Reference

ITO, S., NIWA, T., & KUDO, A. (1948). *Zootech. Exp. Sta. Res. Bull.* **55**. 1-15.

Treatment of Ketosis in Dairy Cows by Potassium Chlorate

Sir,—During the past 3 years experiments have been conducted in a herd of Ayrshire cows in which ketosis has been prevalent. The results of 2 experiments in which the effect of changes of diet on the incidence of ketosis has been investigated have been reported (Blackburn, Castle & Strachan 1958; Blackburn, Castle, Drysdale & Strachan, 1959).

In the course of these 2 experiments a wide range of products used in the treatment of ketosis were tried and found to be ineffective. No treatment had any lasting effect and the ketosis was only eliminated when the cows went out to pasture in the spring. During the third experiment conducted this last winter (1958-9) 9 cases of ketosis were treated with 1 oz. of potassium chlorate (B.P.) twice daily for 3 consecutive days. The chlorate was administered either as a drench in 1 pint of water, in paper boli, or mixed in the cow's concentrate ration. Individual treatment was started when a daily sample of milk of a cow gave a reading of +3 or higher in a controlled Rothera's test as described earlier (Blackburn *et al.*, 1959). The effect of the treatment on milk yield and on the number of animals with positive Rothera's tests is shown in Fig. 1. Prior to the treatment the mean daily milk yield had been declining gradually although the cows had calved on average only 18 days previously and normally the yield would have been increasing to a peak. During and after treatment there was a marked and immediate rise in yield. When treatment started, the milks of all the 9 cows gave positive reactions to Rothera's test, whereas 4 days later they were all negative. Samples of blood taken from the cows before and after treatment gave mean values of 32.9 and 7.9 mg. acetone per ml. respectively.

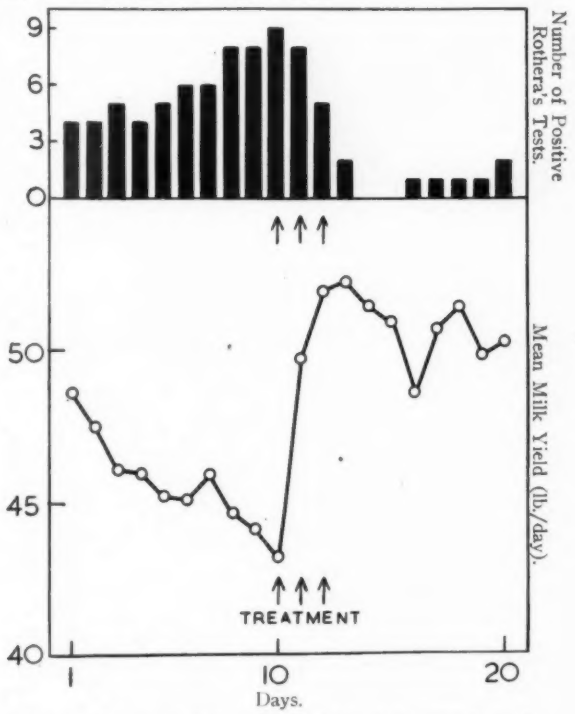


FIG. 1.—The mean daily milk yield and the number of animals with positive reactions to Rothera's test before and after the 3-day treatment of nine cases of ketosis with potassium chlorate.

The results reported here have been obtained with the type of ketosis occurring in one particular herd and it is not suggested that potassium chlorate will necessarily be so effective with types of ketosis that may occur in other herds. Talsma (1952), for example, had complete cures in only 50 per cent. of his cases of clinical ketosis when using 2½ oz. of potassium chlorate per day, but it is possible that he was treating more than one type of ketosis. On the other hand, Good (1958) using the same dose as the authors reports 100 per cent. successful results since March, 1957.

Further work on both curative and prophylactic treatment with potassium chlorate is planned for this coming winter.

Yours faithfully,
P. S. BLACKBURN,
M. E. CASTLE,
A. D. DRYSDALE.

Hannah Dairy Research Institute,
Kirkhill,
Ayr.
September 10th, 1959.

References

BLACKBURN, P. S., CASTLE, M. E., & STRACHAN, N. H. (1958). *Brit. vet. J.* **114.** 323.
———, ———, DRYSDALE, A. D., & STRACHAN, N. H. (1959). *Ibid.* **115.** 423.
GOOD, F. D. (1958). *Vet. Rec.* **70.** 1,000.
TALSMA, D. (1952). "Research and theories on post-parturient acetonaemia in Friesian milch cows." R. Van Der Velde, Leeuwarden, Netherlands.

The Treatment of Warble Infestation

Sir,—The new systemic insecticides have found their first important application in veterinary medicine as larvicides for the control of migrating warbles in cattle. Two organo-phosphorus compounds are already in general use in the United States for this purpose and tests in Britain with one of these, 0, 0-dimethyl, 0-2, 4, 5-trichlorophenyl phosphorothioate (Dow, ET-57) have already been described by Kendall (1958) and Harrison (1958).

Field trials with the second insecticide, 0, 0 diethyl, 0-7 (3 chloro, 4 methyl coumarinyl) phosphorothioate (Asuntol, Bayer 21/199) were commenced by the writers in 1956, and have been continued during the following two winters of 1957-8 and 1958-9. At least 90 per cent. reduction of the warble infestation was obtained when one litre of a 2 per cent. emulsion was applied as a wash to the backs of cattle by scrubbing; 72 animals treated once between November and January averaged 0.2, 0.6 and 1.1 warbles per beast when examined in March, April and May respectively, as compared with an average of 2.4, 10.4 and 13.8 warbles in each of 34 untreated control animals. Although separate groups of cattle were treated once in November, December or January, within these limits the time of application did not appear to affect the biological control. Most of the animals used in these trials were young store cattle aged 9 months to 2 years weighing 200 kg. and upwards, but a similar number of adult breeding stock has also been treated. No evidence of toxicity has been observed in any of the experimental animals.

A further organo-phosphorus compound, 0, 0-dimethyl (1 hydroxy-2, 2, 2-trichloroethyl) phosphonate (Neguvon, Bayer L13/59) has also been tested in field trials. When given orally at the rate of 80 mg. per kg. bodyweight Neguvon gave good results in initial trials, but this method of administration was discontinued when symptoms of toxicity developed in a proportion of the treated animals. Subsequently, Neguvon was applied at the rate of 400 ml. of a 2 per cent. solution as a wash on the backs of yearling cattle averaging 150 kg. bodyweight. Applied in this way, this material gave excellent results, and there were no side effects. Of 12 cattle treated in February, 10 remained free of warbles compared with one out of 12 untreated animals. A similar treatment in April killed all warbles present, and prevented further larval development in 9 out of 11 animals compared with 11 controls showing normal infestation.

Trials with these compounds are continuing, and full results will be reported at a later date.

Yours faithfully,
J. C. WOOD,
C. L. MALONE,
W. B. SPARROW,
P. R. M. BROWN.

Cooper Field Research Station,
Berkhamsted Hill,
Berkhamsted,
Herts.
September 9th, 1959.

References

HARRISON, I. R. (1958). *Vet. Rec.* **70.** 849.
KENDALL, S. B. (1958). *Ibid.* **70.** 486.

GENERAL

Diagnosis of Johne's Disease

Sir,—During the recent B.V.A. Congress at Folkestone I was among those who attended the Symposium on Johne's disease. Like many others I was impressed by the papers presented on 4 aspects of this disease. Again, like many others, I was disappointed that no improved diagnostic procedure appeared to be forthcoming.

Members in practice who have made use of the complement fixation test will agree I am sure that, despite its faults, it still forms the most satisfactory method of diagnosis for the control and/or eradication of Johne's disease on a herd basis.

Mrs. Maclay, in replying to a direct question from Mr. Gould, admitted that the authors could give no fresh advice to the practitioner who is faced with Johne's disease as a herd problem.

In view of this admission may I, through the courtesy of your columns, request that in the absence of a better diagnostic procedure the B.V.A. ask the Ministry of Agriculture to make the complement fixation test more readily available on a herd basis to us misguided practitioners and our ill-advised clients?

Yours faithfully,
A. STEELE-BODGER.

10, Bore Street,
Lichfield,
Staffs.
September 12th, 1959.